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Iron & Steel Foundries Regulations, 1953

Never in our experience has the worth of employers' associations been shown more clearly than in the case of the negotiations with the interested parties for the *mise au point* of the Regulations indicated in our heading. By centralizing the study of the draft among a few, yet thoroughly representative, people, a better perspective of the whole position was acquired and there was a quick realization of what was essential in the new proposals and what was susceptible to modification. Thus, a comparison between the Draft Regulations which appeared on page 155 of the JOURNAL of January 5, 1953, and the new Order, printed elsewhere in this issue, reveals a large number of changes—alike welcome and sensible.

The definitions of a "cupola," "dressing and fettling operations" and an "iron foundry" are now both clearer and of a limiting nature. Of cardinal importance is the postponement until January, 1956, of some of the more onerous stipulations, such as those regulations dealing with dust and fumes and bathing facilities. The provision of safety boots, which figured in the Draft, now no longer appears. Our experience has been that, where boots have been provided by the employers acting on their own initiative, the safety motive has not been accepted in the foundry, and these well-turned-out articles have been taken for "best," with "gym" shoes still being worn in the shops. Even where spats have been provided, there was a case of a man wearing them for travelling and discarding them in the foundry—until he became a casualty! This matter is now a subject for discussion between the trade unions and the employers' associations. It needs emphasizing that wide discretion is allowed to the factory inspectorate to grant exemption certificates in case of difficulties arising with the smaller and older foundries. In some built-up areas, there just is not sufficient room for the installation of bath and changing rooms, unless manufacturing space be sacrificed.

For the larger concerns, there is nothing very frightening in the new Regulations, but for the smaller firms there may be real hardship. We know of one case where even the provision of gangways will adversely influence production. Moreover, though a small concern, it has provided excellent washing, wardrobe and rest-room facilities. It would be helpful if the Regulations could cease to apply to the smallest category of foundries, that is, the sort of differentiation that used to obtain between a factory and a workshop. There is a movement on foot to create a similar set of regulations for the non-ferrous foundries, where there is a very large number of quite small concerns. Laudable ambition for a firm to extend should never be birth-strangled. One of Britain's largest steelworks had its origin in a kitchen, and no doubt other cases could be cited. Within our own knowledge, less than 20 years ago, a foundry now employing about 50 people was a one-man business. For the larger concerns, however, the Regulations are to be welcomed, as better progress can be made under hygienic and tidy conditions, which are the underlying principles, and which were first outlined in the "Garrett" Report.

F

Foundry Health and Safety*

New Regulations in Operation from January 1, 1953

Following the Private Members' Bill which was withdrawn rather less than a year ago on the understanding that the Government would introduce Regulations to govern health-and-safety precautions for iron and steel foundries, draft measures† published in February last have now been considered and final Regulations approved. What follows is a full account of these Special Regulations, which take into account modifications introduced by committee representation from the industry. They are issued under the authority of the Ministry of Labour and National Service. The Regulations make provision for the safety, health and welfare of persons employed in iron and steel foundries, and impose requirements for the purpose of promoting safety and cleanliness in workrooms, and the provision and maintenance of protective equipment, bathing facilities and clothing accommodation; as well as prescribing measures for the suppression of dust and fumes.

Citation and commencement

1. These Regulations may be cited as the Iron and Steel Foundries Regulations, 1953, and (save as provided in Regulations 7 and 9) shall come into operation on January 1, 1954.

Interpretation

2. (1) The Interpretation Act, 1889(d), shall apply to the interpretation of these Regulations as it applies to the interpretation of an Act of Parliament.

(2) For the purposes of these Regulations, unless the context otherwise requires, the following expressions have the meanings hereby assigned to them respectively, that is to say: "approved respirator" means a respirator of a type for the time being approved in writing by the Chief Inspector of Factories for all or any of the purposes of regulation 8 (1) (*b*); "cupola or furnace" includes a receiver associated therewith; dressing or fettling operations" includes stripping and other removal of adherent sand, cores, runners, risers, flash and other surplus metal from a casting and the production of a reasonably clean and smooth surface, but does not include (*a*) the removal of metal from a casting when performed incidentally in connection with the machining or assembling of castings after they have been dressed or fettled, or (*b*) any operation which is a knock-out operation within the meaning of these Regulations; "iron foundry" and "steel foundry" mean those parts of a factory in which the production of iron or castings (not being the production of pig-iron or the production of steel in the form of ingots and not including die-casting) is carried on by casting in moulds made of sand, loam, moulding composition or other mixture of materials, or by shell moulding, or by centrifugal casting in metal moulds lined with sand, together with any part of the factory in which any of the following processes are carried on as incidental processes in connection with, and in the course of, such production, namely, the preparation and mixing of materials used in the foundry process, the preparation of moulds and cores, knock-out operations and dressing or fettling operations; "knock-out operations" means all methods of removing castings from moulds and the following operations when done in connection therewith, namely, stripping, de-coring and the removal of runners and risers; "pouring aisle" means an aisle leading from a main gangway or directly from a cupola or furnace to where metal is poured into moulds; and "principal Act" means the Factories Act, 1937, as amended by or under any other Act;

Application and Operation

3.—(1) These Regulations shall apply to all iron foundries and steel foundries. (2) Subject to the provisions of this paragraph, the provisions of these Regulations shall be in addition to and not in substitution for or in diminution of other requirements imposed by or under the principal Act: Provided that so much of section 47 of the principal Act as requires exhaust appliances to be provided and maintained shall not apply in relation to dust resulting in any iron or steel foundry from any knock-out operations or any dressing or fettling operations if the provisions of paragraphs (5) or (6), as the case may be, of Regulations 7 are complied with in the case of those operations.

Arrangement and Storage

4. For the purposes of promoting safety and cleanliness in workrooms the following requirements shall be observed:—

(*a*) moulding boxes, loam plates, ladles, patterns, patternplates, frames, boards, box weights, and other heavy articles shall be so arranged and placed as to enable work to be carried on without unnecessary risk;

(*b*) suitable and conveniently-accessible racks, bins or other receptacles shall be provided and used for the storage of other gear and tools;

(*c*) where there is bulk storage of sand, fuel, metal scrap or other materials or residues, suitable bins, bunkers or other receptacles shall be provided for the purpose of such storage.

Work near Furnaces

5. No person shall carry out any work within a distance of 12 ft. from a vertical line passing through the delivery end of any spout of a

* See, also, Editorial comment, p. 469 of this issue.
† JOURNAL, February 5, 1953, p. 155.

cupola or furnace, being a spout used for delivering molten metal, or within a distance of eight feet from a vertical line passing through the nearest part of any ladle which is in position at the end of such a spout, except, in either case, where such is necessary for the proper use or maintenance of a cupola or furnace or when there is no danger to the person carrying it out from molten metal which is being obtained from the cupola or furnace or is in a ladle at the end of the spout.

Gangways and Pouring Aisles

6.—(1) In every workroom to which this regulation applies, constructed, reconstructed or converted for use as such after the making of these Regulations and, so far as reasonably practicable, in every other workroom to which this regulation applies, sufficient and clearly-defined main gangways shall be provided and properly maintained which—

(*a*) shall have an even surface of hard material and shall, in particular, not be of sand or have on them more sand than is necessary to avoid risk of flying metal from accidental spillage;

(*b*) shall be kept, so far as reasonably practicable, free from obstruction;

(*c*) if not used for carrying molten metal, shall be at least 3 ft. wide;

(*d*) if used for carrying molten metal, shall be (i) where truck ladles are used exclusively, at least 2 ft. wider than the overall width of the ladle; (ii) where hand shanks are carried by not more than two men, at least 3 ft. wide; (iii) where hand shanks are carried by more than two men, at least 4 ft. wide; and (iv) where used for simultaneous travel in both directions by men carrying hand shanks, at least 6 ft. wide.

(2) (*a*) Subject to the provisions of sub-paragraph (*c*) of this paragraph, in every workroom to which this regulation applies constructed, reconstructed or converted for use as such after the making of these Regulations, sufficient and clearly-defined pouring aisles shall be provided and properly maintained, which (i) shall have an even surface of hard material and shall, in particular, not be of sand or have on them more sand than is necessary to avoid risk of flying metal from accidental spillage; (ii) shall be kept so far as reasonably practicable free from obstruction; (iii) shall be wide enough not to imperil the safety of persons carrying or pouring molten metal and shall in no case be less than 18 in. wide.

(*b*) Subject as aforesaid, in every other workroom to which this regulation applies, sufficient pouring aisles shall be provided and properly maintained, which (i) shall have a firm and even surface and shall be kept so far as reasonably practicable free from obstruction; (ii) shall be wide enough not to imperil the safety of persons carrying or pouring molten metal, and shall be not less than 18 in. wide.

(*c*) This paragraph shall not apply to any workroom or part of a workroom if, by reason of the nature of the work done therein, the floor of that workroom or, as the case may be, that part of a workroom has to be of sand.

(3) In this regulation " workroom to which this regulation applies " means a part of an iron foundry or steel foundry in which molten metal is transported or used, and a workroom to which this regulation applies shall be deemed for the purposes of this regulation to have been constructed, reconstructed or converted for use as such after the making of these Regulations, if the construction, reconstruction or conversion thereof was begun after the making of these Regulations.

Dust and Fumes

7.—(1) Open coal, coke or wood fires of a portable nature shall not be used for the purpose of heating workrooms.

(2) Open coal, coke or wood fires shall not be used for heating or drying ladles inside a workroom unless adequate measures are taken to prevent, so far as practicable, fumes or other impurities from entering into or remaining in the atmosphere of the workroom.

(3) No open coal, coke or wood fires shall be used for drying moulds except in circumstances in which the use of such fires is unavoidable.

(4) Mould stoves, core stoves and annealing furnaces shall be so designed, constructed, maintained and worked as to prevent, so far as practicable, offensive or injurious fumes from entering into any workroom during any period when a person is employed therein.

(5) All knock-out operations shall be carried out, (*a*) in a separate room or in a separate part of the foundry suitably partitioned off, being a room or part of which, so far as reasonably practicable, effective and suitable local exhaust ventilation and a high standard of general ventilation are provided; or (*b*) in an area of the foundry in which, so far as reasonably practicable, effective and suitable local exhaust ventilation is provided, or where compliance with this requirement is not reasonably practicable, a high standard of general ventilation is provided.

(6) All dressing or fettling operations shall be carried out (*a*) in a separate room or in a separate part of the foundry suitably partitioned off; or (*b*) in an area of the foundry set apart for the purpose; and shall, so far as reasonably practicable, be carried out with effective and suitable local exhaust ventilation or other equally effective means of suppressing dust, operating as near as possible to the point of origin of the dust.

(7) This regulation shall come into operation on January 1, 1956.

Protective Equipment

8.—(1) The occupier shall provide and maintain suitable protective equipment of the types and for the processes or work respectively hereinafter in this regulation specified for the protection of workers engaged in any such process or work, *viz.*:

(*a*) Suitable gloves or other protection for the hands for workers engaged in handling any hot

material likely to cause damage to the hands by burn, scald or sear, or in handling pig-iron, rough castings or other articles likely to cause damage to the hands by cut or abrasion.

(*b*) Approved respirators for workers carrying out any operations creating a heavy dust concentration which cannot be dispelled quickly and effectively by the existing ventilation arrangements.

(*c*) Suitable goggles or other eye protection for workers engaged in (i) working at a spout of, or attending to, a cupola or furnace where there is risk to the eyes from molten metal (ii) pouring molten metal, or (iii) work involving risk to the eyes from hot sand being thrown off.

(2) Each respirator provided for the purposes of paragraph (1) (*b*) of this regulation shall carry a distinguishing mark indicating the person by whom it is intended to be used and no person shall wear or be required to wear a respirator not carrying his mark or a respirator which has been worn by another person and has not since been thoroughly disinfected.

(3) Every employed person shall make full and proper use of the equipment provided for his protection in pursuance of paragraph (1) of this regulation, and shall without delay report to the occupier, manager or other appropriate person any defect in, or loss of, the same.

Bathing Facilities and Clothing Accommodation

9.—(1) The occupier shall provide and maintain, for the use of persons employed in the foundry, adequate and suitable facilities for taking shower or other baths, with suitable arrangements for privacy (including, in close proximity to such facilities, suitable accommodation for dressing, undressing or changing clothes, and an adequate number of lockers or other suitable arrangements for the accommodation of clothing belonging to persons using the baths) and such arrangements as are reasonably practicable for drying clothing belonging to persons using the baths.

(2) The facilities provided for the purposes of paragraph (1) of this regulation shall be placed in charge of a responsible person or persons and maintained in a clean and orderly condition.

(3) This regulation shall come into operation on January 1, 1956.

Exemptions

10.—(1) If the Chief Inspector of Factories is satisfied in respect of any foundry, or in respect of foundries of any specified class or description, that, owing to the special conditions, or special methods of work or otherwise, any requirement of Regulations **5, 6, 7** and **9** of these Regulations can be suspended or relaxed without danger to the health or safety of the persons employed, or that the application of any such requirement is for any reason impracticable or inappropriate, he may by certificate in writing (which he may at his discretion revoke at any time) exempt that foundry or foundries of that class or description from the application of that requirement subject to such conditions as may be specified in the certificate.

(2) Where any certificate is issued under this regulation, a legible copy thereof, showing the conditions (if any) subject to which it has been granted, shall be kept posted up in every foundry to which the exemption applies in a position where it may conveniently be read by the persons employed.

The Regulations make provision for the safety, health and welfare of persons employed in iron and steel foundries, and impose requirements for the purpose of promoting safety and cleanliness in workrooms, and as to the provision and maintenance of protective equipment, bathing facilities, and clothing accommodation; as well as prescribing measures for the suppression of dust and fumes.

Shipbuilding Research

The activities of the British Shipbuilding Research Association over the period from April 1, 1950, to March 31, 1953, are recorded in the fifth report issued by the council, which mentions that the period saw the completion of important items of research, including the Lucy Ashton trials. The Association was established in 1944, and the fifth report points out that expenditure has settled down to about £180,000 to £190,000 per annum. Extra-mural research expenditure accounted for up to £70,000, internal research expenditure for a like sum, the library and intelligence section for about £12,000, and administration for about £30,000.

Reference is made to the completion of the new and additional structures testing machine at Glengarnock, and to the work in the engineering laboratories of the Royal Technical College, Glasgow, was the special experimental boiler built for the Association. At the Clydebank tank of John Brown & Company, Limited, apparatus has been developed and completed by means of which a model may be forced to pitch while being towed, thus, it is hoped, simulating rough-water conditions. Testing will begin shortly. At this tank, also, experiments are being carried out on a large-scale model propeller fitted with trip wires near the leading edge, the purpose being to explore the possibility of laminar flow occurring in propellers and to determine its effect on performance.

Truck Act Quoted

Albion Spring Company, Limited, West Bromwich, were fined 20s. and 16s. costs on October 5 on each of two summonses of failing to pay two girl employees in the current coin of the realm. The proceedings were taken under the Truck Act of 1831. It was stated that the firm held the two girls responsible for over-booking 300 gross of springs. They were offered the chance of repaying a bonus of £10 at the rate of 5s. a week over 20 weeks, or being dismissed. After the first 5s. had been deducted from one girl's pay she left and the other girl did so after the second deduction was made.

The Stipendiary, Mr. Kenneth Wood, said the 122-year-old Act contained 27 stringently-worded sections. He said that he did not regard the case as serious, but suggested that in future the firm should adopt a more simple and effective means of checking work done. To some extent the treatment which the girls received was contributed to by their own failure to keep records.

Effect of Stripping Time on the Structure of Chill-cast Irons

By G. J. Shaw, B.Sc. and V. Kondic, B.Sc., Ph.D.

The effect of stripping time after pouring on the structure of normal grey irons has been studied over a limited range of carbon and silicon contents, when cast into a chill mould in 1.25 in. dia. bars. Similar experiments have also been carried out with nodular iron. It is shown that the length of time in the mould after pouring has an important effect on the structure, the shorter the time the bar is in the mould the greater the likelihood of obtaining the carbon in the graphitic form, throughout the cross-section of the bar.

Introduction

Cast iron enjoys a somewhat unique position amongst the industrial alloys for the number of variations that can be produced in the cast structure. One of the highly controversial points is that of the origin of graphite flakes in the structure, namely, whether these form directly from the liquid or through the decomposition of a carbide, and under what conditions. This controversy still persists, but in a limited way. It has been demonstrated by numerous investigators that (*a*) different types of graphite flakes may form through different mechanisms, and (*b*) one and the same type of graphite phase may also form by different mechanisms.[1 2 3 4 5] The object of the present article is to give further evidence that one of the graphite forms, generally described as the undercooled and classified as type "D" on the A.S.T.M./A.F.S. charts,* can form by decomposition in the solid state. This evidence has been obtained by previous investigators by a variety of experimental techniques: (*a*) quenching from different temperatures prior to, and during solidification;[1 2 4] (*b*) volume-change measurements;[4] and (*c*) metallographic studies of sections and varying both the composition and the rate of cooling.[3] In the present work, a new technique was used for the same purpose. This is based on the idea of filling a cast-iron chill mould and stripping the cast bar after different times. Owing to the rapid rate of cooling, the bar solidifies by the process of skin formation, and if the stripping time is very short, a bar can be produced in which the outer skin is just strong enough at the time of stripping to support the metal core still held molten within. In this way the outer skin which forms in the mould is exposed immediately after solidification to a reheating effect very near and just below the eutectic temperature. Any unstable phases in the skin may then decompose. The structure in the central regions would, however, be similar to that normally obtained with slow rates of cooling. Furthermore, these structures may be readily compared with those obtained in unstripped bars of the same composition.

*Tentative pictorial representations of graphite form and size standards, prepared jointly by the American Society for Testing Materials and the American Foundrymen's Society.

Method and Results

This work is an extension of a programme of studies of the structure of continuously-cast cast iron, which will be described elsewhere. In order to confirm the origin of some of the structures obtained by casting in the continuous process, it was necessary to obtain some cast bars by the batch or static process of casting into a chill mould. All melting was carried out in an H.F. furnace of 10-lb. capacity, using a Salamander crucible. The composition of raw materials used is given in Table I. To reduce any oxidation losses during melting, a layer of charcoal was kept on top of the melt. Care was taken not to superheat the metal above 1,450 deg. C. and a pouring temperature range of 1,300 to 1,330 deg. C. was adhered to.

TABLE I.—*Compositions of Cast Irons Used.*

Iron	C	Si	Mn	S	P
Valley pig ..	4.00	1.08	0.22	0.042	0.047
Refined cylinder	3.00	2.50	0.6	0.07	0.1

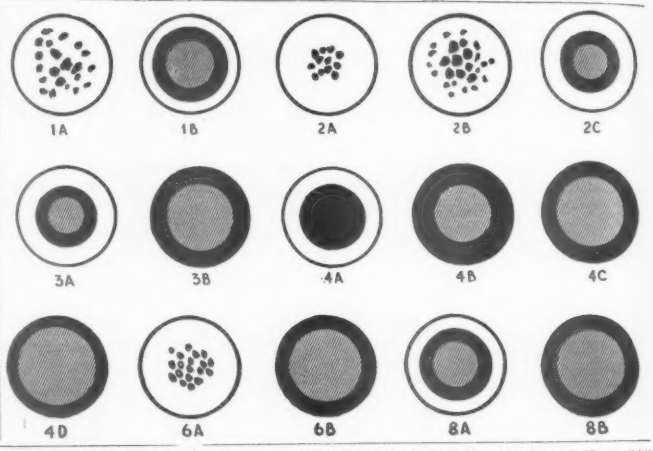
In order that a comparison could be made with the continuously-cast product it was decided to use 1.25-in. dia. cast-iron moulds 6 in. long. When the metal was at the required pouring temperature, the furnace was tapped twice; at the first tap one of the two moulds was filled and allowed to cool down in the normal manner for 3 or 4 min. With the second tap, immediately the mould was full, a stop-watch was started, and after a predetermined time the mould was opened. The bar, still at red heat, was stripped free and allowed to cool down on a piece of asbestos board. Cooling curves were taken on two bars by inserting 24-g. Chromel-Alumel thermocouples lightly coated with a refractory cement, down the moulds, such that the hot junction should be $\frac{1}{8}$ in. from the edge of the cast bar. The cooling curves were obtained by using an Everett-Edgcumbe high-speed recorder.

A similar procedure was adopted with the nodular iron, in both cases 1.75 per cent. addition of 15 per cent. Mg (in nickel/magnesium temper alloy) and 0.5 per cent. addition of the inoculant SMZ (Si 63 per cent, Mn 6 per cent., Zr 6 per cent.) were made whilst the metal was in the furnace. The resulting chemical analyses, fractures and microstructures of the grey irons are summarized in Table II. Figs. 1, 2, 3 and 4 show the

TABLE II.—*Analyses and Results from the Grey-iron Series.*

Bar No.	C	Si	Cooling procedure.	See Fig. No.
1A	3.82	1.09	In mould	—
1B	3.82	1.09	Stripped in 15 sec.	—
2A	3.36	0.89	In mould	1, 2
2B	3.36	0.89	Stripped in 30 sec.	—
2C	3.36	0.89	Stripped in 15 sec.	3, 4
3A	2.96	1.70	In mould	5, 6
3B	2.96	1.70	Stripped in 15 sec.	7
4A	2.91	2.05	In mould	—
4B	2.91	2.05	Stripped in 15 sec.	—
4C	2.91	2.05	Stripped in 7 sec.	—
4D	2.91	2.05	Stripped in 5 sec.	—
6A	2.81	1.89	In mould	—
6B	2.81	1.69	Stripped in 5 sec.	—
8A	3.6	1.83	In mould	—
8B	3.6	1.83	Stripped in 5 sec.	—
9A*	2.8	1.8	Half bar stripped in 11 sec.	16, 17

Fractures of the Bars



* For fractures see Fig. 16. Key to the Fractures: White Iron—white; Type "D" Graphite in Ferrite—black, and Type "A" Graphite in Pearlite—cross hatched.

resulting microstructures of an iron (Nos. 2A and 2C, Table II) when stripped from the mould after 15 secs. and also when allowed to cool down in the mould for 3 or 4 min. The bar allowed to remain in the mould shows a white-iron edge of the acicular type (Fig. 1). The centre of this bar (Fig. 2) has types A and B (A.S.T.M.) flake graphite in pearlite, in a mainly white-iron matrix. If a bar of this composition is stripped from the mould, the edge consists of acicular white iron (Fig. 3) then a ring of undercooled or type "D" graphite in ferrite, and at the centre types "A" and "C" flake graphite in pearlite, with some associated free ferrite (Fig. 4).

The same casting conditions were reproduced for an iron of a different composition having a higher Si content (No. 3, Table II). The edge of the unstripped bar had a dendritic white-iron structure, (Fig. 5), and the centre consisted of types "D" and "B" graphite in ferrite; some pearlite was also present (Fig. 6). The stripped bar of this composition was completely machinable. The edge consisted of a mixture of graphite, ferrite and pearlite; a small amount of residual carbide was also present (Fig. 7). The centre of the specimen was type "A" graphite in pearlite, with some associated free ferrite, the same as Fig. 4.

The results of the nodular iron experiments are summarized in Table III.

TABLE III.—*Nodular-iron Results.*

Bar No.	C	Si	Mg	Cooling procedure.	Fracture.
5A	2.7	2.67	0.14	In mould	White
5B	2.7	2.67	0.14	Stripped in 5 sec.	Grey edge
8C	3.6	2.35	0.13	In mould	White
8D	3.6	2.35	0.13	Stripped in 5 sec.	Grey

In the nodular irons, interesting structural effects were also found. The hypo-eutectic irons, when allowed to remain in the mould, consist at the edge solely of a dendritic white iron (Fig. 8). There is an increase in dendrite size at the centre, due to the slower rate of cooling, but no nodules are present (Fig. 9). In the stripped bar, the centre contains a few large nodules in pearlite in a white-iron matrix (Fig. 10). At the edge, (Fig. 11), there are a large number of small nodules in pearlite; there is also some carbide present. The hyper-eutectic irons show a similar tendency, the main difference being that in the bar allowed to cool in the mould there are a few nodules present throughout the white-iron matrix (Fig. 12). The stripped bar has a large number of small nodules, mainly in ferrite at the edge (Fig. 13), and larger nodules in pearlite, with a small amount of retained carbide, in the centre (Fig. 14).

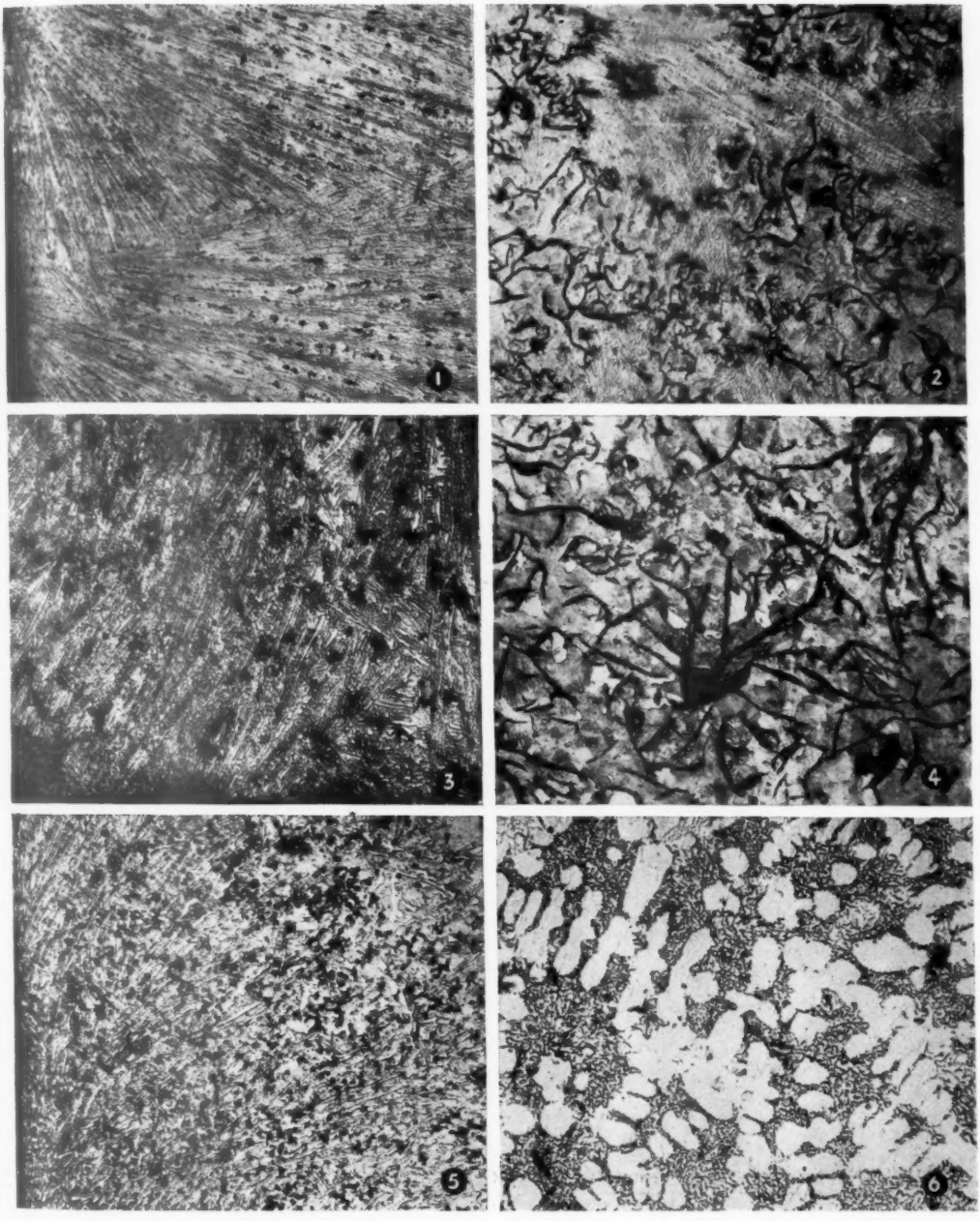
The cooling curve obtained in a stripped bar, demonstrating the reheating effect which occurs at the edge of the bar is shown in Fig. 15.

Comment

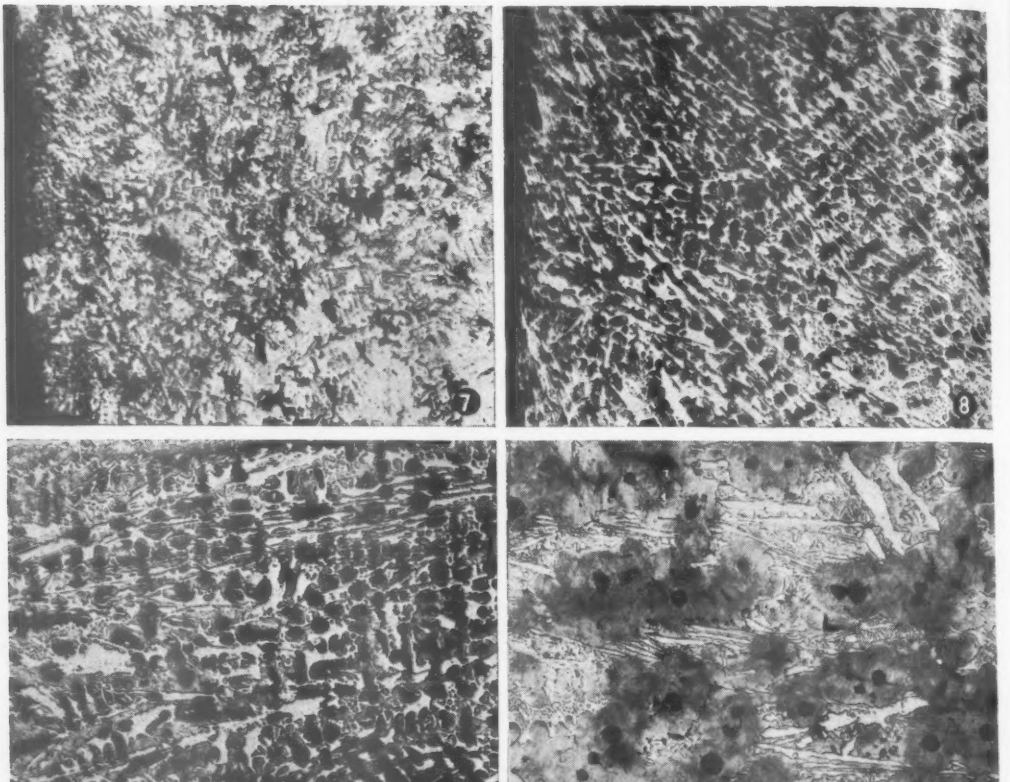
The primary object of the experiments described was that of studying whether a short delay in cooling of cast iron just below the eutectic temperature could bring about the breakdown of the cementite phase and result in the appearance of some of the recognized graphite phases in the cast structure. The two main variables selected, that of composition and Mg addition, were chosen with the purpose of obtaining the most suitable primary structure which could decompose with the thermal treatment used. It is proposed to discuss the compositional variable first, and then to examine the evidence obtained on the subject of decomposition of carbide in the solid state.

(*i*) *Effect of Carbon and Silicon Contents*

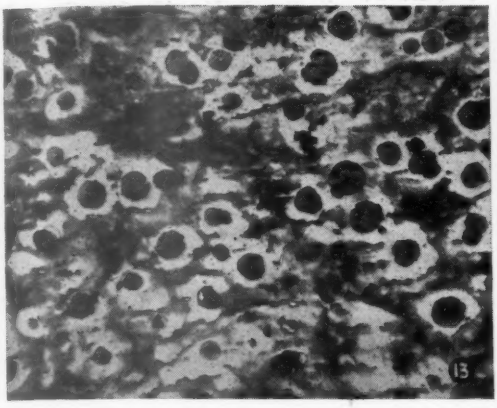
An examination of the descriptions of the fractures in Table II shows that the carbon content does not appear, within the range of values studied, to exert any major influence on the proportion of the carbon present in the graphitic state. Whilst carbon provides the material necessary for graphite to form, silicon appears to be the controlling

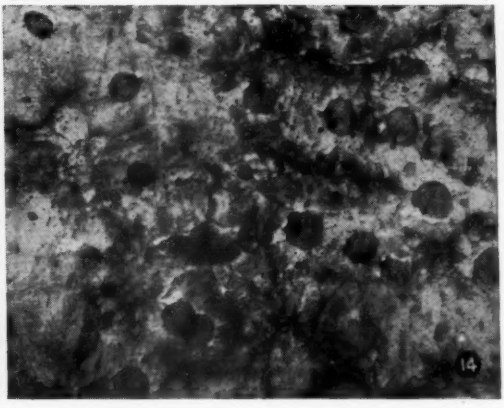


FIGS. 1 TO 6.—*Photomicrographs of Various Test-bars, all* × 150, *Etched*:—FIG. 1, *White Iron, Edge of Unstripped Bar;* FIG. 2, *Mottled Iron, Centre of Unstripped Bar;* FIG. 3, *White Iron, Edge of Stripped Bar;* FIG. 4, *Grey Iron, Centre of Stripped Bar;* FIG. 5, *Dendritic White Iron, Edge of Unstripped High-silicon Iron Bar, and* FIG. 6, *Grey Iron, Centre of Unstripped High-silicon Iron Bar.*



FIGS. 7 TO 12.—*Further Photomicrographs of Experimental Bars, all* × 150, *Etched*:—FIG. 7, *Edge of Stripped High-silicon Iron Bar;* FIGS. 8 TO 11, *Hypo-eutectic Nodular Iron;* FIGS. 8 AND 9, *Edge and Centre, respectively, of Unstripped Bar, and* FIGS. 10 (*centre*) AND 11, *Edge of Stripped Bar;* FIG. 12, *Edge of Unstripped, Hyper-eutectic Nodular-iron Bar.*





FIGS. 13 AND 14.—*Hyper-eutectic Nodular Iron*:—FIG. 13, *Edge, and* FIG. 14 *Centre, of Stripped Bars.*

element inducing the carbon to appear as graphite in the structure. This statement is supported when the results of bars 1A, 1B, 2A, 2B and 2C are compared with the results of 8A and 8B. When the carbon content is high and the silicon low it is not possible, using this type of mould—and hence this cooling rate—to obtain a grey-iron structure in the bar. On the other hand, by raising the silicon content, a grey-iron structure forms even when the carbon content is relatively low.

On the bases of microscopic examination, studies of fractures and the cooling curves taken, the mechanism of solidification of the bars appears to be as follows: The unstripped bar cools normally, and the amounts of the carbide phase at the edge of the undercooled "D" graphite zone next to the edge (which appears distinctly sooty in the fracture), and, finally, of the normal type "A" or "B" graphite in the centre of the bar, are essentially controlled by the chemical composition of the iron and the cooling rate used. Stripping the bar is concluded to take place when the white, outer ring and the "D" ring are completely solid and the central (grey) zone is still liquid. The net result of stripping is to cause a reheating of the white ring to the temperature near but below the eutectic temperature, whilst the rest of the bar is then cooled at a very much slower rate than in the case of the unstripped bar. As a consequence of these heating effects, the carbide in these zones breaks down to austenite and graphite. The austenite phase at room temperature may appear as ferrite, if the rate of cooling used for the given composition allows sufficient time for diffusion of carbon to occur. This normally happens, as the time required is short and diffusion is extremely rapid. The graphite phase of the outer ring may also show different appearances at room temperature. This graphite may be either in the form of short, chunky flakes (Fig. 7), or in the distinct form of "D" graphite as for example that shown in Fig. 6. This effect appears to be due mainly to the temperature level and the extent of carbide transformation. The chunky type may be due to the turbulent pouring conditions breaking up the normal cast structure. This view is supported by the fact that this form only occurs at the extreme edge and the width of this zone is very small. A further possibility is that it may form as a slightly lower temperature than the "D"-type graphite.

No new data were obtained by the experiments described which would throw light on the mechanism of solidification of that part of the bar which was completely liquid when the bar was stripped. It is therefore not proposed to consider this problem, but to examine instead the evidence made available by these experiments on the formation of some types of graphite in the solid state.

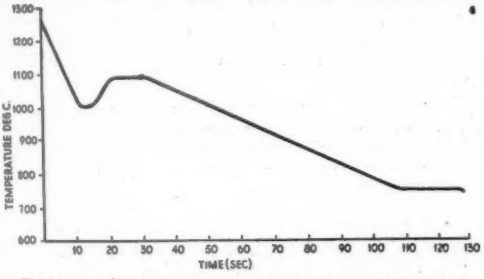


FIG. 15.—*Cooling Curve taken near the Edge of a Bar stripped from the Mould in* 11 *sec.*

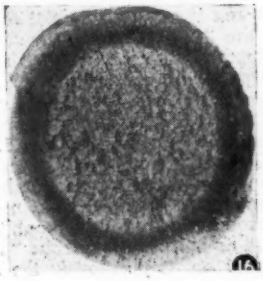
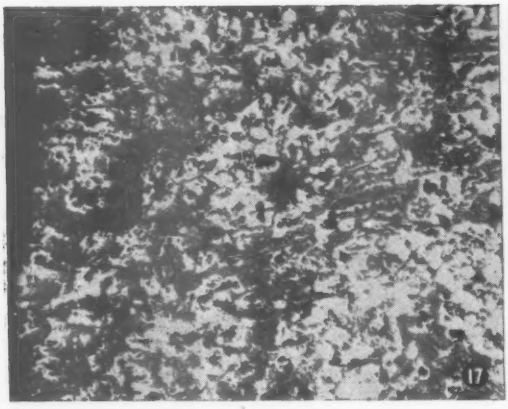
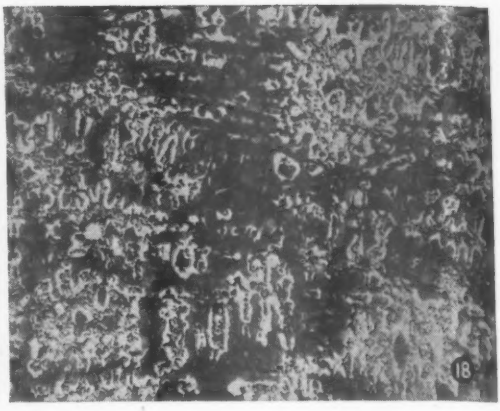


FIG. 16.—*Fracture of the Half-stripped Bar.*





FIGS. 17 AND 18.—*Bar No. 9, Stripped Edge Structure and Unstripped Side showing Undercooled Graphite. respectively.*

(*ii*) *Formation of Graphite in the Solid State*

The main value of the evidence provided by these experiments depends on the correct interpretation of the sequence of events that take place in the outer ring of the stripped bar, which is normally white in the unstripped bar. In order to check whether this sequence is of the general type as described above, a special bar was cast (No. 9, Table II) in which only one-half of the bar was stripped. Consequently, in the horizontal section, showing the fracture, Fig. 16, one-half of the bar cooled as unstripped, whilst the other half was stripped and subject to the reheating effect. It is clear from the fracture, and this is also supported by the microscopic examination, that the net effect of stripping of only one-half of the bar, is that of extending the continuous "D" or "sooty" ring to the outer surface of the stripped face. The microscopic examination reveals, further, that the stripped outer ring contains both "D" and small amounts of chunky-graphite phases (Fig. 17), whilst in the unstripped part of the outer ring only small amounts of the chunky graphite could be found in a white iron matrix, as in Fig. 5. The "D" or sooty ring had the same type of graphite in both the stripped and unstripped part of the bar but the amount of pearlite was distinctly greater in the unstripped part (Fig. 18). The structure of the central grey zone of this bar was uniform throughout and showed no special features. The presence of the "D" graphite below the edge on the unstripped side may be due to the high silicon content, the particular cooling rate being slow enough, even when unstripped, for some decomposition to occur.

It is clear from this microscopic evidence and from the cooling curve, Fig. 15, that the structures and types of graphite observed in the outer ring of the stripped bar are essentially due to the breakdown of the carbide phase in the solid state. The question whether this graphite is in the chunky form or more eutectiferous "D" form appears to depend on its position in the bar, whether it is at the extreme edge, and also possibly upon the reheating temperature attained. Both of these types of graphite are essentially the same and are produced by the same mechanism.

The shape of nodular graphite, being so different from the flake-graphite form, it was thought to be of interest to check the validity of the above general comment, by performing a similar experiment with a Mg.-treated iron. The structural sequences obtained in these bars followed an exact analogy with the above experiments. The outer edge of the unstripped bar had very few small graphite nodules, the ring being essentially composed of carbide eutectic (Fig. 12). When the bar of the same melt was stripped, the outer edge was mainly grey, with a large number of nodules in a pearlite and ferrite matrix (Fig. 13). Here again, it was concluded, the nodules of the outer ring formed in the solid state by the decomposition of the carbide phase. The central parts of the bars in these experiments did not show any unusual features.

Conclusions

Further evidence has been obtained to confirm the earlier theories that certain forms of graphite in grey cast iron can form in the solid state. Additional experimental work is, however, required to determine the exact time and temperature sequence of these solid transformations, as well as to show whether these decomposition products can form directly from the liquid state.

Acknowledgments

The authors are greatly indebted to Professor A. J. Murphy for his encouragement and provision of laboratory facilities; to Sheepbridge Engineering, Limited, for financial aid, and to Mr. R. A. Jones for laboratory assistance.

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Conference Paper Author

Mr. W. H. White, F.R.S.A., one of the Authors of the paper "External Dust Control for Pedestal Grinders," printed on page 481 of this issue, was educated at Bradford Grammar School and Leeds University. He served his apprenticeship with the Patent Conveyor Company, of Bradford (England), and Providence, R.I. (U.S.A.), of which company he eventually became general manager and managing director. He served in the army as technical M.T. officer (Captain) from 1915 to 1919. In 1920, he was appointed chief consulting and installation engineer to an English group of manufacturers for the establishment of industrial plants in U.S.A. and Australia, including Paton & Baldwins (Tasmania); Carbonisers Pty., Limited (Australia); and the Passaic Worsted Company, N.J. (U.S.A.). Prior to the last war he established his own consulting business in London and Melbourne, and was patentee of a combination cam-gear; a multi-coin prepayment mechanism; "Readylock"; and several other inventions. He served in the army again in the last war as a staff officer (W.O.) with the rank of Major, after which he joined Sir Alex. Gibb & Partners (consulting engineers), London, and remained with them until his appointment as development engineer, B.C.I.R.A., in 1951.

Road Transport Service to Continent

In response to the appeal by the Association of British Chambers of Commerce for the views of manufacturers on the question of a road transport service between this country and the Continent, before reporting back to the association, the Halifax Chamber of Commerce are approaching the local Engineering Federation for their views as to whether they favour such a link between the West Riding and the Continent. When this matter was discussed at the monthly meeting of the Halifax Chamber, the president, Mr. E. Ollerenshaw, pointed out that such a service was actually in operation, but the protective rates were prohibitive. In view of the high cost of crating machinery for foreign delivery *via* rail and ship, which ran as much as £280 a consignment, Mr. Ollerenshaw thought engineering firms particularly would be interested in the subject. A cross-Channel lorry service would enable much expensive packing to be dispensed with and thus would enable the manufacturers to be in a more competitive position in the Continental market. The president also pointed out that there would be a saving of time, for by rail and ship deliveries often took two and three weeks.

Australian Foundry Exhibition

The first foundry [equipment and supplies] exhibition ever to be held in Australia has recently taken place in Sydney. With it was held a four-day technical convention which had a large contingent participating from the Australian—Victoria branch of the Institute of British Foundrymen. One of the largest stands of the exhibition was that of the Gibson Engineering (Sales) Pty., Limited, which showed Australian-built moulding machines as well as sand-testing machines, core-blowers, etc.

Marine Turbine Development

After nearly 70 yrs. of development, the British marine engineering industry is now able to begin production of a gas turbine for the propulsion of ships as an economic proposition in competition with the steam turbine and the Diesel engine. This is the result of eight years of concentrated work in the research shops of the Parsons & Marine Engineering Turbine Research and Development Association at Wallsend-on-Tyne. Of the many difficulties confronting the association in developing the gas turbine engine to the point where it would be able to compete with steam and Diesel power, one of the most formidable was to design a model which would run on cheap crude oil. The high operating costs involved in using a refined oil would more than outweigh the other advantages which the gas turbine has over competitive forms of power.

However, the research workers at Wallsend have recently found substances which, when added to the crude oil, effectively reduce its corrosive effect on the turbine blades. But there is still a great deal of work to be done. For instance, a model must be produced which will work for longer periods at much higher temperatures without detriment to the component parts, as ships' engines are expected to have a life of about 100,000 hrs., *i.e.*, rather more than 20 yrs.' service.

Last week the workshops of PAMETRADA were open to inspection by ship builders and owners, who have been offered designs for the gas turbine, for which the 20 firms collaborating in the Association's work are now able to accept orders.

House Modernization Urged

Sir Patrick Dollan has been urging Scottish housewives to impress on their local and national representatives the urgent need for action to renovate sound old housing property and keep it in use by the provision of modern amenities of hot water, indoor sanitation, and a bath. Speaking at a meeting of the Women's Advisory Council on Solid Fuel (Scottish Committee), Sir Patrick told the women representatives that there were almost 300,000 sub-standard houses in Scotland, all of them built up to 100 years ago, and none of them had a bathroom or scullery. Roughly they accommodated about 1,600,000 people, and the tenants would have to wait for 40 years if they were going to overtake the problem at the present rate of building 30,000 new houses a year in Scotland. He thought the time had come when local authorities should take advantage of the clauses in the Housing Acts which permitted the conversion of these houses to modern requirements. Local authorities seemed to think it was cheaper to build new houses than to renovate old ones, yet to build new houses cost anything between £1,600 and £1,900, while many of these older houses could be converted at a cost of between £200 and £250.

S.-g. Iron Licensees Meeting

Under the auspices of The Mond Nickel Company, the third international meeting of licensed producers of magnesium-treated, spheroidal-graphite iron was held in Paris last month, and was attended by 150 representatives of licensees in 18 countries. All aspects of the production and application of S.-g. irons were discussed. Subsequently, a tour in which 100 persons participated, was made to the works of four licensed foundries in eastern France, namely, J. Marichal Kétin & Cie, Berlaimont; Gailly Frères, Charleville; Société des Aciéries de Longwy, Sedan; and Société des Fonderies de Pont-à-Mousson, at the kind invitation of these firms.

Publications Received

G.E.C. Equipment at the Steel Company of Wales Limited. Published by the General Electric Company, Limited, Magnet House, Kingsway, London, W.C.2.

The object of this brochure is to deal—using clear diagrams—with the many items of plant installed in the new works of the Steel Company of Wales, Limited, which are devoted to tinplate manufacture.

Belgium and Luxembourg—An overseas Economic Survey, by A. H. Tandy, C.B.E. Published by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 3/6 net.

The reviewer has always held the opinion that Belgium is a country of no small importance among manufacturers of castings, both iron and steel, but a search through this publication fails to yield any confirmation of this. In the rest, the report follows the standard pattern.

Foseco Foundry Developments.—Foundry Services Limited, of Long Acre, Nechells, Birmingham, England, have launched this new publication.

It is a dignified 20-page magazine, devoid of displayed advertising matter. The only criticism the reviewer has to make is that the figures on some of the graphs on page 19 are a little two small for easy reading. The contents are well balanced and cover such diverse subjects as a new phase in the development of exothermic feeding sleeves; a comparison between hexachlorethane and nitrogen for degassing light alloys; a description of a miniature experimental cupola; a fluidity test for fluxes and the reduction of melting losses on copper-base alloys.

Non-ferrous Melting Practice and Flux Treatment for the Production of Sound Castings. Published by the Harborough Construction Company, Limited, Market Harborough, Leics.

It is obvious that a brochure of this character will contain references to the products of the issuing company, but in this case the text suffers but little. It is written by a metallurgist who is well versed in the subject under discussion, and the hints given are alike practical and useful. To obtain the best results from the proprietary materials mentioned, it is necessary to institute good foundry practice, and the study of this cyclostyled, 22-page brochure will help towards the production of sound castings. It is available to readers on writing to Market Harborough.

Denmark—An overseas Economic Survey. Published by H.M. Stationery office, York House, Kingsway, London, W.C.2. Price 3/6 net.

The reviewer, probably like many of his readers, imagined that Denmark was a mainly agricultural country with a few large engineering works and a very big brewery. From this publication, however, it is shown that the nation exports manufactured goods totalling more than half that of agricultural produce. The iron foundries and engineering shops increased employment in 1951 as compared with the previous year by 2,000 workpeople, to reach a total of 27,200.

The various headings used in the survey are perhaps not the best that could be selected. For instance, but little is conveyed by the use of the headings Iron and Steel Works; Other Metal Works; Iron and Metal Goods; Iron Foundries and Machine Works; Electro Mechanical Products; and Shipyards, Motor Vehicles, Cycles, etc. The descriptive matter, following the tables quoted, is excellent and gives a much better picture of what is happening.

Booking B.I.F. Space

Since it began in 1915 the British Industries Fair has built up for itself such a reputation that it is now unquestionably regarded as the most important and outstanding trade exhibition of the year. The products of some 90 trades are annually displayed—which constitute between them more than half the U.K.'s exports—and recent Fairs have been attended by an average of 16,000 buyers from overseas.

It is difficult to assess exactly the amount of business which stems from an exhibition such as the B.I.F. One exhibitor claimed to have obtained business worth £60,000 from his catalogue entry alone (an advance edition of 25,000 copies of the catalogue is printed and distributed abroad three to four months before the Fair), while another dealing in expensive capital equipment recently credited a large order to his display at the B.I.F. three years ago.

The cost of exhibiting may be no more than £60. Rent for sites in the London sections is 6s. 6d. per sq. ft. In the Birmingham section it is 5s. 6d. per sq. ft., and Birmingham has ground available for outdoor exhibits at 1s. per sq. ft. Floor plans showing the London sites available are kept up to date at regional offices of the Board of Trade, and copies showing the sections appropriate to each trade, together with space application forms, can be obtained on demand. Inquiries about space for the trades covered by the Birmingham section of the Fair should be made to the general manager, British Industries Fair, New Street, Birmingham.

Proposed Swedish Specifications

In 1950, a Swedish proposal for the standardization of grey cast iron, comprising five different classes and based on the properties of only one standard test-bar, was presented but it did not become a Swedish standard. It was considered necessary that the correlation between mechanical properties and castings of different dimensions first be established. Since 1950, a committee within the foundry division of *Sveriges Mekanförbund* has been studying the desired correlation. As this work is now partly finished, a new proposal has been presented. It comprises for the present only three classes, with minimum tensile strengths of 15, 20 and 25 kg per sq. mm. (9.5, 12.7 and 15.9 tons per sq. in.) in the standard test-bar. The maximum hardness for the different classes is 200, 225 and 250 Brinell. Standards for the testing of tensile strength and hardness are also proposed. In a special schedule probable minimum values for tensile strength and maximum values for hardness are given for castings of different dimensions, with round or rectangular cross-sections. These latter values are only recommended values and not delivery requirements. The progress so far made is detailed in the August issue of *Gjuteriet*.

Taking up the Slack

Being situated at Kingston-on-Thames, the foundry of Victor Moyle & Company, 38, Park Road, Hampton Wick, does much business amongst the owners of small pleasure craft using the river. As a side-line, the firm has produced a series of nautical novelties which are made by a subsidiary company, Moyle Marine Products, of Woking. They include such mounted castings for a dinghy ashtray, a capstan as a cigarette box or tobacco jar or in combination as a smoker's set. Then there is a line of book-ends made from nautical components. This is a profitable type of enterprise for founders to undertake, as it takes up the slack of the production line when awaiting delivery of patterns, confirmation of orders, and the like.

Application of External Dust Control to a Standard 24-in. Pedestal Grinder*

Part I. Dust Control System, By W. H. White, F.R.S.A., Part II. Dust Observations and Determinations, By W. B. Lawrie, M.Sc., F.R.M.S., A.I.M.

The dust cloud generated by a 14-in. stand grinder, running at a peripheral speed of 5,000 ft. per min., has already been controlled by a new system of local exhaust ventilation in which the extraction air is applied externally to the wheel hood. This work was published at a meeting of the London branch of the Institute of British Foundrymen in September, 1952. The present Paper describes further work which led to the application of the external system to a standard 24-in. dia. wheel, running at a peripheral velocity of 9,000 ft. per min. The loci of the dust clouds have been observed and recorded photographically, and "still" photographs, taken from the cinematograph film, are included in this Paper. Finally, a preliminary series of dust counts is given as an indication of the efficiency obtained in laboratory conditions.

PART I.—DUST CONTROL SYSTEM

Introduction

A new method of external dust control for a pedestal grinder was developed at the British Cast Iron Research Association, and described in a paper[1] presented to the London branch of the Institute of British Foundrymen. The wheel used for this early work was 14-in. dia., and ran at a peripheral velocity of 5,000 ft. per min. It was mounted over a dust-collecting box of ample dimensions, so that the dust that was projected into the collecting box would settle there. In consequence, the application of local exhaust ventilation to the box itself proved to be unnecessary. Those dust streams which did not settle in the collecting box were controlled by an external exhaust system applied through a nozzle fitted over the top of the guard and two slotted side ducts, one on each side of the wheel.

When this work on the small wheel had been completed, the Foundry Atmospheres Committee decided that efforts should be made to apply the system to a 24-in. wheel, and experimental work was commenced on a standard double-ended machine fitted with 24-in. dia. by 2-in. wide wheels, running at peripheral velocities of 9,000 ft. per min. The experiments were conducted in two stages, the first stage consisting of a straightforward application of the external system as previously described,[1] whilst in the second stage the necessary modifications were made to adapt the external system to the standard wheel in use. Two fans were tried at each stage.

Fan Specifications

One fan was a paddle-blade type, "V" belt driven, with an inlet and outlet area of 36 sq. in., rated at 1,100 cub. ft. per min. against a total fan head of 6-in. water-gauge and absorbing 3 b.h.p. running at 3,300 r.p.m. For the purposes of the test, the fan inlet was reduced to 14.12 sq. in. area with a free outlet. The fan displaced 660 cub. ft. or air per min. at 5-in. water-gauge, and absorbed 2.5 b.h.p. This fan did not give the desired efficiency in dust control and so a second fan was used.

The more-efficient fan was a high-pressure motor-driven centrifugal fan, with a 7-in. dia. inlet and a 3½-in. dia. outlet. This fan was rated at 475 cub. ft. per min. against a total fan head of 17-in. water-gauge, running at 2,840 r.p.m. and absorbing 2 b.h.p. For the purposes of these tests, the fan inlet was reduced to 14.12 sq. in. area, with a free outlet to atmosphere. The fan displaced a total of 646 cub. ft. per min. at 8- to 10-in. water-gauge and absorbed 2.4 b.h.p. running at full load.

External Exhaust System

For the initial series of experiments, an external exhaust system was applied to the wheel after the conventional system had been removed. This system (see Fig. 1) was essentially the same as the system that had proved successful on the smaller wheel.[1]

No direct exhaust connections were fitted, either to the hood or to the collecting box below the wheel. The top nozzle opening was 5 by ¼ in. and the air movement through this opening was of the order of 137 cub. ft. per min., with a linear velocity of 5,300 ft. per min. The vertical ducts, one on each side of the wheel, carried openings 6 by ½ in. giving an air flow of 73 cub. ft. per min. each at a linear velocity of about 3,500 ft. per min. The work rest was perforated and surrounded by a duct which was provided with a slot in the same plane as the work rest. This slot was ½-in. wide and extended 13 in. along the front, and 4 in. along each side of the rest. Approximately 375 cub. ft. per min. passed through the slot at a linear velocity of about 3,500 ft. per min.

The external system was shown to be unsatisfactory when using the paddle-blade fan, and so the centrifugal fan was substituted. The effects observed are given in Part II of this Paper where

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* Paper presented to the Institute of British Foundrymen at the fiftieth annual meeting in Blackpool. The Authors are, respectively, development engineer, British Cast Iron Research Association, and H.M. Engineering Inspector of Factories.

FIG. 1.—*External Exhaust System applied to a* 24- *by* 2-*in Wheel.*

it will be seen that, although the fan having the higher pressure exerted some influence on the dust clouds, it did not control them sufficiently well to be considered satisfactory. It was quite evident during the experimental work that the collecting box of small volume was responsible for the failure of the dust-control system, and that the external system as applied to the 14-in. wheel would only work on the 24-in. wheel if a much bigger collecting box were provided, if, in fact, the collecting box on the 24-in. wheel were of such a volume that it released the pressure developed by the wheel as effectively as the larger box had done on the smaller wheel.

Combined Exhaust System

It was obvious that, in order not to overload the external exhaust system, either the collecting box would have to be increased in volume to release the pressure caused by the fan action of the wheel, or the external system would have to be used in conjunction with the conventional internal system exhausting from the collecting box. This would release the air pressure generated by the wheel by putting the collecting box under negative pressure.

The grinder was equipped with this combined system as shown in Fig. 2. For ease of construction in laboratory conditions 3-in. dia. flexible pipes were used as fan connections, although these pipes do not give the best conditions for air flow because the corrugated internal surfaces induce turbulence. One pipe was brought over the top of the cowl and was terminated in a 5 by $\frac{1}{4}$ in. flanged nozzle protruding some 2 in. beyond the cowl. Close to the nozzle taper-piece, one 2-in. pipe connection was tapped off from either side of the 3-in. pipe, and turned vertically downwards. These side ducts tapered to $\frac{1}{4}$-in. dia. at their lower ends, which were closed, and reached to a point about 1 in. above the work rest. The side ducts were fitted with swivel connections at their upper ends to allow them to swing backwards and forwards about a horizontal axis. Exhaust slots, 6 by $\frac{1}{4}$ in. were cut in the front of these ducts. The normal work rest, which was 10 by $5\frac{1}{2}$ in., was perforated, and mounted, by totally enclosing, on the top of the collecting box. A 3-in. dia. flexible pipe was connected to the usual low-level opening in the collecting box.

The paddle-blade fan was connected to the system in the first instance but proved to be incapable of controlling the dust below the breathing level of the operator. In consequence the centrifugal fan was fitted. This fan extracted 170 cub. ft. per min. from the top nozzle at a linear velocity of 6,500 ft. per min.; 73 cub. ft. per min. from each vertical duct at a linear speed of 3,500 ft. per min., and 330 cub. ft. per min. from the

FIG. 2.—*Combined Exhaust System applied to a* 24- *by* 2-*in. Wheel.*

collecting box at a linear speed of 6.750 ft. per min. In these conditions, the system gave good dust control, but it is essential that these air movements be maintained, and due allowance should be made when designing a system for any build-up of back pressure caused by filters or any other obstruction.

Finally, the system was tested with a 16-in. dia. wheel in order to determine the effects that would appear if a worn wheel were used by an operator who failed to adjust the top scraper at the cowl outlet. Under these conditions, there was a gap of 4½ by 3½ in. between the wheel and the cowl top, but the dust control was unimpaired. It appears therefore that the adjustment of the top scraper is not critical when using the combined exhaust system.

Conclusions (Part I)

(1) The standard collecting box fitted to the machine was too small to release the pressure generated by the wheel. In consequence the dust did not settle.

(2) Because the dust did not settle in the collecting box, the external system was overloaded.

(3) It was necessary to release the pressure in the collecting box, and this was done by connecting it to the fan in the conventional manner.

(4) The rest was perforated and mounted directly on the top of the collecting box.

(5) The external exhaust system was fitted to the top and sides of the wheel.

(6) The combined system gave good dust control. (See Part II.)

(7) The size of the gap between the wheel top and the cowl did not appear to affect this control.

PART II.—DUST OBSERVATIONS AND DETERMINATIONS

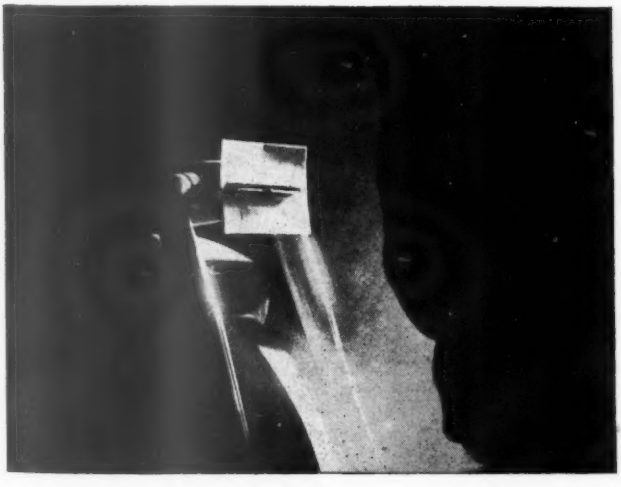
Introduction

The various stages in the development work described in Part I of this Paper have been observed, and photographed, by the method published in earlier papers,[1, 2] and the dust illustrations are reproduced from the 35-mm. cinematograph film negative. These observations were supplemented by thermal precipitator dust counts in order to provide a quantitative estimate of the efficiency of the different stages of the work. Some of the observations were made when grinding wood because the smoke so produced was easily visible. In all cases, however, the final result was observed and photographed when grinding sand-cast grey pig-iron. This was done to ensure that each stage of development was assessed on the dust which the system was designed to control. The pig-iron was selected to give very heavy dust clouds because it was thought desirable to test the system in conditions of considerable overload.

External Exhaust System

The first tests were made on the external system using both a paddle-blade fan and a centrifugal fan; neither gave adequate dust control. Fig. 3 was taken from a position behind the operator and shows the dust rising up to his face well above the level of the top nozzle. Fig. 4 was taken from a position facing the operator. The top nozzle had been increased in size and had been placed so as to give the maximum efficiency, but the dust cloud can be seen above the nozzle level, as it moved up the operator's body and rose to his face.

The reason for this result was that the collecting box was too small to release the pressure generated by the rotating wheel. This can be seen quite clearly from Figs. 5 and 6, where the wheel was being run without the exhaust system. Fig. 5 shows that the pressure generated in the collecting box



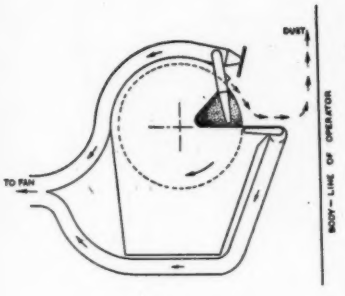


FIG. 3.—*External System Layout and Operating Photograph showing Dust rising past the Top Nozzle and moving up the Operator's Body to his Face.*

FIG. 4.—*External System showing Dust rising past the Top Nozzle and moving up the Operator's Body to his Face (see line sketch, Fig. 3).*

was sufficient to blow the dust upwards through the perforated rest. Fig. 6 is a photograph taken whilst pig-iron was being ground, without local exhaust ventilation. After a few seconds grinding, the pressure generated by the wheel proved sufficient to carry the dust right round the system and deliver it from the top nozzle. It was evident, therefore, that this pressure would have to be relieved. The dust counts confirmed the general picture provided by the observation technique. In all cases samples were taken at the level of the work rest, the nozzle, the actual breathing level of the operator, and his forehead level.

Table I shows that the paddle-blade fan operating on the external system does not reduce the cloud sufficiently at breathing level, although it apparently exerts some influence at the operator's forehead level.

Tables II and III show that the centrifugal fan gave somewhat better control, although the breathing-level concentration remained at about 2,000 particles per ml. From Table II it appears that the system did not control the dust at forehead level, although Table III indicates reasonably-good control at this level. The observation technique, however, led to the general conclusion that the centrifugal fan in the external system was exerting a definite influence at this high level, although it did not control the dust sufficiently well at breathing level.

TABLE I.—*Thermal-precipitator Slides* for the Paddle-blade Fan on the External Exhaust System.*

Sample No.	Position.	Particles per ml.
1	General atmosphere	113
2	Work level	26,580
3	Nozzle level	7,219
4	Breathing level	7,369
5	Forehead level	1,881

* For thermal-precipitator slides reported in Tables I to VII the dust was incinerated before counting, but the slides referred to in Tables VIII and IX were not incinerated.

TABLE—II. *Thermal-precipitator Slides for the High-pressure Fan on the External Exhaust System.*

Sample No.	Position.	Particles per ml.
11	General atmosphere	217
12	Work level	21,778
13	Nozzle level	2,754
14	Breathing level	1,904
15	Forehead level	1,796

TABLE III.—*Thermal-precipitator Slides for the High-pressure Fan on the External Exhaust System. (Different occasion from Table II.)*

Sample No.	Position.	Particles per ml.
16	Work level	15,253
17	Nozzle level	3,001
18	Breathing level	1,984
19	Forehead level	369

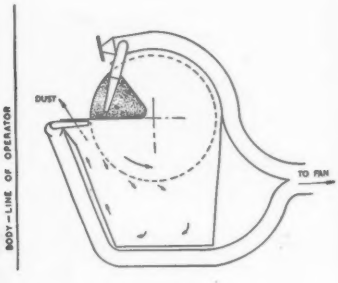


FIG. 5.—*Line Diagram and Photograph with Fan not working. The Pressure developed by the Wheel is blowing Dust from the Collecting Box through the Perforated Rest.*

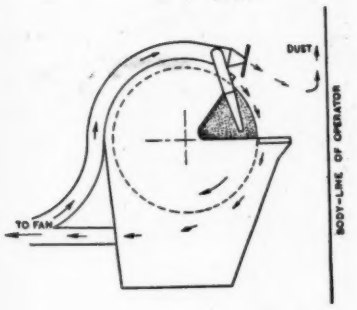


FIG. 6.—*Diagram and Operating Photograph with Fan not working. The Pressure developed by the Wheel is blowing Dust from the Collecting Box round the Ducts and out at the Nozzle.*

Combined Exhaust System

Dust observations and determinations were then made on the combined system fitted with the paddle-blade fan. The results showed quite clearly that the dust cloud was under the influence of the exhaust system, but it was also evident that the control could be improved. Table IV indicates the conditions obtained when grinding under the combined system with the paddle-blade fan.

Finally, the combined system was used with the centrifugal fan and in the experimental conditions imposed, this gave very good dust control. Fig. 7 shows the system working when grinding wood. The smoke which was not carried away by the low-level duct from the collecting box flowed out of the wheel hood and was collected by the external part of the system. This illustration also shows the smoke entering the top nozzle, and it will be seen that the air flowing into this nozzle cuts off the smoke in almost a straight line, level with the nozzle itself. Fig. 8 shows a similar effect on the dust cloud produced when grinding pig-iron. (The bright reflections from the operators' clothing in Figs. 7, 8 and 9 should not be confused with the dust.) These results were confirmed by the dust counts which are given in Tables V and VI.

TABLE IV.—*Thermal-precipitator Slides for the Paddle-blade Fan on the Combined Exhaust System.*

Sample No.	Position.	Particles per ml.
6	General atmosphere	194
7	Work level	9,712
8	Nozzle level	3,840
9	Breathing level	640
10	Forehead level	515

In order to determine the effect of the gap between the wheel and the guard top, the scraper

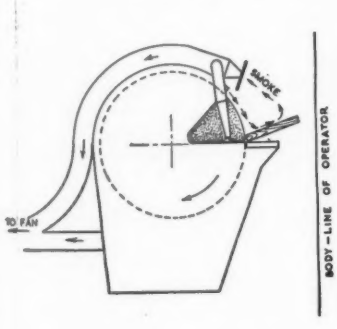


FIG. 7.—*Diagram and Operating Photograph for the Combined System with the Centrifugal Fan. Close-up Grinding of Wood showing good Smoke Control. (Note the Smoke cut off by the Top Nozzle.)*

FIG. 8.—*Combined System with the Centrifugal Fan; Close-up Grinding of Pig-iron showing good Dust Control. (Note Dust cut off by the Top Nozzle; see Line Sketch, Fig. 7.)*

TABLE V.—*Thermal-precipitator Slides for the High-pressure Fan on the Combined Exhaust System.*

Sample No.	Position.	Particles per ml.
20	Nozzle level	659
21	Breathing level	194
22	Forehead level	216

TABLE VI.—*Thermal-precipitator Slides for the High-pressure Fan on the Combined System. (Different occasion from Table V).*

Sample No.	Position.	Particles per ml.
27	Work level	982
28	Nozzle level	412
29	Breathing level	102
30	Forehead level	75
31	Work level (repeat No. 27) ..	924
32	Nozzle level (repeat No. 28) ..	392
33	Breathing level (repeat No. 29)	85
34	Forehead level (repeat No. 30)	134

was opened up to give $\frac{7}{16}$-in. space between the wheel top and the underside of the guard top. At the same time, the side-pieces were removed so that there were spaces of $\frac{7}{8}$ in. and $1\frac{3}{8}$ in. respectively between the wheel sides and the guard. The alterations did not affect the photographs obtained in the ciné film, and the dust counts confirmed this observation (see Table VII).

In view of the observation that the gap above the wheel did not appear to be critical, it was

TABLE VII.—*Thermal-precipitator Slides taken with Top Scraper and Side-pieces Removed to Give Space of $\frac{7}{16}$ in. above Wheel and $\frac{7}{8}$ in. and $1\frac{3}{8}$ in. on Each Side Respectively, Using the High-pressure Fan on the Combined Exhaust System.*

Sample No.	Position.	Particles per ml.
23	Work level	1,946
24	Nozzle level	240
25	Breathing level	280
26	Forehead level	223

decided to fit a 16-in. dia. wheel and lift the scraper. This would be the equivalent of working a worn wheel without any adjustment to the scraper that is fitted to many machines. Fig. 9 shows the results obtained. Much more dust is leaving the hood, but it is being collected by the external part of the exhaust system and the illustration shows the efficiency with which the dust cloud is cut off at the top, along the line of the nozzle. The corresponding dust results are given in Table VIII, where it will be seen that the breathing level dust concentration is the same as the general atmosphere concentration.

TABLE VIII.—*Thermal-precipitator Slides* for the 16 in. dia. Wheel, High-pressure Fan and Combined Exhaust System.*

Sample No.	Position.	Particles per ml.
35	General atmosphere	247
36	" "	297
37	Work level	1,725
38	Nozzle level	640
39	Breathing level	257
40	" "	246
41	Forehead level	286
42	" "	202

* For thermal-precipitator slides reported in Tables I to VII the dust was incinerated before counting, but the slides referred to in Tables VIII and IX were not incinerated.

Finally, a further series of dust counts were taken with the 24-in. dia. wheel fitted, and the combined system running normally. These slides were not incinerated before counting so that, like Table VIII, they carry all the general atmospheric dust, relatively harmless from the foundry point of view, which could have been burnt off. The results are given in Table IX, where once again the dust concentrations at the breathing level of the operator are the same as the general atmosphere concentrations.

FIG. 9.—*Combined System with Centrifugal Fan and 16-in. Wheel. Good Dust Control is secured in spite of the Big Gap over the Wheel Top. (Note the Dust cut off by the Top Nozzle; see Line Sketch, Fig. 7.)*

TABLE IX.—*Thermal-precipitator Slides for the 24 in. dia. Wheel, High-pressure Fan and Combined Exhaust System.*

Sample No.	Position.	Particles per ml.
43	General atmosphere	2,033
44	" "	1,943
45	Work level	10,016
46	Nozzle level	1,730
47	Breathing level	2,392
48	" "	2,607
49	Forehead level	2,326
50	" "	1,296

The dust counts, throughout, show the wide fluctuations that so often appear in these determinations, but they confirmed the observation method in all cases. When the combined system was used with the centrifugal fan, dust counts were taken on the general atmosphere before commencing and at the breathing level of the operator when grinding. The salient feature of these counts was that there was no increase of dust concentration when grinding. It appears therefore, from the counts and the observations, that this system, in the conditions obtaining at the time, was controlling all the dust generated by the grinding process.

Conclusions (Part II)

(1) The relatively-small collecting box fitted to the standard 24 in. dia. wheel which was used developed sufficient pressure to overload the external system to such an extent that it did not provide adequate dust control.

(2) The combined exhaust system gave very good dust control when the machine was fitted with a 24-in. dia. wheel.

(3) The gap between the wheel top and the guard did not influence the efficiency of the dust control. Even when this gap was increased to 4½ by 3½ in., by using a 16-in. dia. wheel, the experimental system still retained control of the dust.

(4) Neither the observation technique, nor the thermal-precipitator counts, showed any measurable difference in dust concentration (at the breathing level of the operator) between operating conditions and general atmospheric conditions before commencing work. This conclusion which is valid for both the 24-in. wheel and the 16-in. wheel, indicates the efficiency of the prototype, operating under the experimental conditions imposed during testing.

Acknowledgments

The exhaust system was developed and tested at the British Cast Iron Research Association in conjunction with the Foundry Atmospheres Committee, and the Joint Standing Committee on Conditions in Iron Foundries of the Factory Department, Ministry of Labour and National Service. The Authors are glad to acknowledge indebtedness to Mr. Colin Gresty for his continued support, and to thank Dr. J. G. Pearce for the ready fashion in which he assisted in his capacity as director of the Research Association.

One of the Authors* is under obligation to Sir George Barnett, H.M. Chief Inspector of Factories, for permission to engage in the work and to publish the results; and to Mr. H. A. Hepburn, C.B.E., H.M. Deputy Chief Inspector of Factories for his cordial interest. Finally, he must record his appreciation of the assistance offered by Mr. F. M. Shaw and Mr. J. Bright of the British Cast Iron Research Association during the collection of dust samples and to the staff of the Photographic and Reproductions Branch of the Air Ministry for able assistance in the preparation of film and photographs.

* W. B. Lawrie.

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[1] White, W. H., and Lawrie, W.B., "External Dust Control for a Pedestal Grinder," FOUNDRY TRADE JOURNAL, 1952, 93, Nos. 1892 and 1893.

[2] Ottignon, R. F., and Lawrie, W. B., "Observation and Control of Dust in Foundry Dressing Operations," *Proc.* Inst. Brit. Foundrymen, 1951, vol. XLIV.

The British Thomson-Houston Company, Limited, was fined £31 10s. and ordered to pay £36 15s. costs at Rugby recently in each of two cases of river pollution. The company was summoned under the Salmon and Fresh Water Fishery Act of 1923 and the Rivers (Prevention of Pollution) Act of 1951. For the Severn River Board, Mr. Kenneth Mynett said that fish life for 13 miles along the Avon was largely destroyed, and Coventry had had to stop taking water from the river for a day or two. The cyanide content three days after fish were first seen to be dying was 14 times the safety limit.

Mr. George Hesketh, for the company, said that it was no wanton or negligent act. Liquid from a plating vat had been syphoned off, as it had been several times in the past without complaint or damage, and flushed into the acid drains. The company was now using another method.

Employers' Liability Insurance. C.F.A. member-firms are reminded that there will be a discussion at the afternoon session of the Joint Iron Council annual convention on November 3, on "Employers' Liability Insurance and the Iron Industry." The discussion will be introduced by Mr. A. E. Sansom, general manager of the Iron Trades Employers' Insurance Association, Limited, who will make special reference to the rise in premium rates consequent upon the increasing number of claims now being made, and will suggest ways in which ironfounders can help to keep the rates down. It will also be open to those present to suggest ways in which the insurance companies can make their own contribution towards solving the problem. The leader of the discussion is well known for his ability to make a forthright presentation of the facts, and a lively and perhaps provocative discussion seems probable.

Parking Lights

The Road Transport Lighting (No. 2) Act, 1953, was introduced as a private Member's Bill (*i.e.*, M.P.), but was taken up by the Government and so placed on the Statute Book last July. This Act concerns what was colloquially known as "parking lights," and which are a departure from the obligations laid down for vehicle lighting during the hours of darkness in the Road Transport Lighting Act, 1927 (the Principal Act). By this new Act, power is given the Minister of Transport to legalize by Regulations the use of what have become known to motorists and users of the road generally as "parking lights." In the 1927 Act, there are certain powers of exemption from lighting given to the Minister, and this 1953 Act now adds another paragraph, thus:—

(*b*) Any vehicles or vehicles of any class or description when standing or parked within one hundred yards of a street lamp or on road verges or in places specially set aside for the purpose."

The phrase "within one hundred yards of a street lamp" is really to show the class of streets or roads where the provisions of this Act may apply, that is, instances where "parking lights" may be used. To explain further, the object of the new Act is to legalize vehicles standing without normal lights but using other lights (*i.e.*, parking lights) in lighted streets. Government spokesmen have stated that the Minister is not likely to use his powers to allow the parking of vehicles on roads unlit, except possibly on road verges. No definition of the term "parking lights" is included in the Act itself; the Minister will define what lights are meant by the phrase in the Regulations to be issued. But it may be added that usually the term applies to a single lamp of small wattage on the side of the vehicle, showing a white light to the front and a red light to the rear of the vehicle.

Various interests are to be consulted by the Minister before making any Regulations, such as the Home Secretary, the police, and other persons, and consideration will be given as to whether the use of such lights will contribute to road safety. Furthermore, such matters will be taken into account as the possible limitation of the lights to classes of vehicles to which the relaxation might apply, the place where vehicles might be parked, and the times when parking would be allowed.

C.F.A. General Bulletin

The General Bulletin of the Council of Ironfoundry Associations for October (No. 78) ranks amongst the best ever issued. There are paragraphs as to the representation on the Joint Iron Council; a conference to be held on simplifying foundry operation; the new iron and steel foundries' health and safety regulations; the pig-iron and scrap position; ironfounding production (which was 6.5 per cent. lower in the third quarter, as compared with 1952); an amendment to Form C90 so as to separate tractor castings from agricultural-machinery castings; the issue of a new statistical survey and censuses of production—about which the C.F.A. appears to share current views expressed in this JOURNAL as to the uselessness of the figures collected.

Another paragraph tells of an American grant in aid to the ironfoundry industry. £25,000 has been made available for the development or initiation of advisory services and £6,000 for technical and managerial training. Taxation, transport, and the Iron and Steel Board are also subjects for comment. The final paragraph deals with building licences and details the course to be taken when envisaging extensions and repairs to iron foundries. This issue also includes statistics for the third quarter of the current year.

Belgian Foundrymen's Association

The Belgian Foundrymen's Association is holding a two-day convention at Charleroi on October 26 and 27. On Monday the annual general meeting is being held at 10.30 a.m. and at 11.15 Mr. J. Goffart delivers his presidential address. From 2 to 5 p.m. there are to be technical sessions. Tuesday is being mainly devoted to works visits, but at 3.30 p.m. there is to be a general discussion, whilst at 8 p.m. the annual banquet will be staged. A special programme has been arranged for the entertainment of the ladies. The following concerns have kindly thrown their works open for visits: Hauts Fourneaux et Fonderies de et à La Louvière; Union des Aciéries Marcinelle, and Ateliers de Construction Electriques de et à Charleroi. Amongst the papers to be presented are "Shell Moulding" by Mr. Buttrey; "Easily-undertaken Steps to increase Productivity" by Mr. Lamoureux; and "Continuous Water-cooled Cupola Practice" by Professor De Sy. Visitors from this country will be made especially welcome. The headquarters are at the Université du Travail, but details can be obtained by writing to Mr. J. Foulon, *Association Technique de Fonderie*, 21, rue des Drapiers, Bruxelles.

New P.O.A. Branch

Mr. Barry Kay, Midland regional director of the Board of Trade and of the Ministry of Supply, was the chief speaker at the inaugural meeting for 1953-54 of the Wolverhampton branch of the Purchasing Officers' Association. Mr. R. E. Gillis, branch chairman, was in the chair. Mr. Kay said that the population of the Midland region had grown nearly twice as fast as the population of England and Wales during the period 1931-51. Despite this fact, the region had the lowest proportion of retired people in the country. Dealing with the location of industry controlled by the Board of Trade according to statute, Mr. Kay said that between 1945 and 1953 about 1,750 industrial expansion plans in the region had been approved, providing manufacturing space amounting to 45,000,000 sq. ft. and giving employment to an additional 56,000 men and 29,000 women. This rate of development is well above the national average, he said. In addition to such expansion within their own region, industries had moved 81 projects to development areas in other parts and had provided employment for an additional 40,000 workers.

Forty Years Ago

In the JOURNAL for October, 1913, the Editor just sits on the fence when discussing the relative merits of drop-bottom and solid-hearth cupolas, for which attitude the writer does not accord him full marks. An illuminating paper on "American Coremaking Practice," by Mr. H. M. Lane is printed; it shows clearly that whilst oil-sand cores were being used in the U.S.A., they were used "almost exclusively" for "tubular parts up to 4-in. dia., for water-jackets of the cylinders for motor-car engines and for radiators." Pitch-base cone mixtures were used for large motors and for mechanical constructions in general. The use of titanium in steelmaking—a subject of current interest—is reported from an American source. There is a wise article by Mr. Riddell on steel additions to the cupola—a subject which he states is not thoroughly understood. Another article shows how 250 castings were made from one runner. The assembly we judge must have been 10 ft. high. The sad story is told of the death, whilst crossing the North Sea, of Dr. Diesel, inventor of the engine carrying his name.

Pig-iron and Steel Production

Statistical Summary of July Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation for July. Table I summarizes activity during the previous six months. Table II gives production of steel ingots and castings in July and Table III, deliveries of finished steel in July, 1953. Table IV gives the production of pig-iron and ferro-alloys in July, 1953, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*General Summary of Pig-iron and Steel Production.*

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (all qualities). Imports.[1]	Output of ingots and castings.	Deliveries of finished steel.	Stocks.[2]
1951	284	170	206	186	175	8	301	244	585
1952[3]	306	190	228	202	171	29	310	252	739
1953—February	328	194	234	214	193	19	352	272	770
March[4]	334	197	237	216	194	23	351	261	804
April	319	189	242	213	189	20	349	270	868
May	319	198	243	215	190	19	351	263	902
June[4]	301	202	238	211	188	14	338	261	914
July	218	197	229	202	153	19	277	—	960

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in July*, 1953.

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex ..	—	3.9	8.2 (basic)	1.6	0.1	13.2	0.6	13.8
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.1	20.3	—	1.6	0.5	22.5	1.0	23.5
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	25.0	—	—	0.1	25.0	0.1	25.1
North-East Coast	1.6	53.8	—	1.1	0.4	55.3	1.6	56.9
Scotland	2.0	25.2	—	0.8	0.5	27.3	1.2	28.5
Staffs., Shrops., Worcs. and Warwick	—	14.0	—	1.0	0.4	14.0	1.4	15.4
South Wales and Monmouthshire	4.7	63.2	5.7 (basic)	0.8	0.1	74.0	0.5	74.5
Sheffield (incl. small quantity in Manchester) ..	5.4	20.0	—	6.8	0.5	31.0	1.7	32.7
North-West Coast	0.5	1.2	4.1 (acid)	0.3	0.1	6.1	0.1	6.2
Total	15.3	226.6	18.0	14.0	2.7	268.4	8.2	276.6
June, 1953[4]	21.4	274.3	20.4	18.1	3.5	327.2	10.5	337.7
July, 1952[4]	20.0	215.3	20.8	14.6	3.1	265.3	8.5	273.8

TABLE III.—*Weekly Average Deliveries of New Non-alloy and Alloy Finished Steel.*

Product.	1951.	1952.[5]	1952. June.	1953. May.	1953. June.[4]
Non-alloy steel:					
Ingots, blooms, billets and slabs[6]	4.0	4.5	4.3	4.1	3.6
Heavy rails, sleepers, etc.	10.1	9.8	11.8	10.2	12.1
Plates, ¼ in. thick and over ..	41.0	41.4	40.7	48.9	49.5
Other heavy prod.	39.9	39.0	41.8	44.7	44.4
Light rolled sections and bars ..	46.7	46.0	47.3	53.8	50.5
Wire rods	15.9	15.9	16.2	15.7	13.8
Bright steel bars ..	6.5	6.5	6.1	7.3	6.8
Hot-rolled strip ..	19.5	18.8	19.3	16.2	17.9
Cold-rolled strip ..	6.0	6.1	6.2	4.5	4.8
Sheets, coated and uncoated ..	30.4	31.6	31.6	31.9	34.3
Tinplate, terneplate and blackplate ..	13.8	16.0	15.9	14.9	13.9
Steel tubes and pipes	20.3	20.1	20.9	20.7	20.0
Tube and pipe fittings	0.5	0.4	0.4	0.4	0.3
Mild wire	11.6	12.2	12.9	10.8	10.0
Hard wire ..	3.5	3.6	3.5	3.6	3.2
Tyres, wheels and axles	3.7	3.5	3.4	4.1	4.4
Forgings (excl. drop forgings) ..	2.3	2.8	2.9	3.2	3.1
Steel castings ..	3.8	4.2	4.4	4.0	4.0
Tool and magnet steel	[8]	0.3	0.3	0.3	0.3
Total	279.5	282.7	289.9	299.3	296.9
Alloy steel	11.4	13.7	13.7	13.1	12.5
Total deliveries from U.K. prod.[9] ..	290.9	296.4	303.6	312.4	309.4
Add: Imported finished steel ..	5.8	13.8	15.5	5.9	4.0
	296.7	310.2	319.1	318.3	313.4
Deduct: Intra-industry conversion[7] ..	55.0	60.2	62.4	56.5	53.8
Total net deliveries ..	241.7	250.0	256.7	261.8	259.6

TABLE IV.—*Weekly Average Production of Pig-iron and Ferro-alloys during July*, 1953.

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	27	2.2	17.4	21.0	1.0	—	41.6
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire ..	8	—	14.6	—	—	1.3	15.9
Yorkshire (incl. Sheffield, excl. N.E. Coast) ..							
Lincolnshire ..	13	—	28.4	—	—	—	28.4
North-East Coast	24	4.3	42.5	—	—	1.4	48.2
Scotland	9	0.7	13.3	2.2	—	—	16.2
Staffs., Shrops., Worcs., and Warwick ..	9	—	7.9	1.5	—	—	9.4
S. Wales and Monmouthshire	7	3.7	20.5	—	—	—	24.2
North-West Coast	8	17.6	—	0.1	—	—	18.5
Total ..	105	28.5	144.6	24.8	1.0	3.5	202.4
June, 1953[9] ..	104	26.9	151.1	28.7	1.1	2.8	210.6
July, 1952[9] ..	103	27.0	139.0	30.2	1.3	4.1	201.6

[1] Weekly average of calendar month.

[2] Stocks at the end of the years and months shown.

[3] Average 53 weeks ended January 3, 1953.

[4] Five weeks all tables.

[5] Other than for conversion into any form of finished steel listed above.

[6] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.

[7] Material for conversion into other products also listed in this table.

[8] Included with alloy steel.

News in Brief

THE FIRST TRADE BODY to affiliate to the newly-formed Birmingham Productivity Association is the Cold Rolled Brass and Copper Association.

PATTERNMAKERS (COVENTRY), LIMITED, Coventry, have removed to Reliance Works, Henrietta Street, Coventry. The new telephone number is 89401 Coventry.

MR. STEPHEN FRANCE BURMAN, well-known Midland industrialist has joined the Board of Imperial Chemical Industries, Limited, as a non-executive director.

DAVID BROWN-JACKSON, LIMITED, recently entertained a party of eighteen Nigerian native administrators, showing them the manufacture of large gear-wheels.

THE FEDERATION OF BRITISH INDUSTRIES, 21, Tothill Street, London, S.W.1, is organizing an export sales conference to be held at Buxton from October 30 to November 1.

THE ATTENTION OF FIRMS which maintain insurance cover against pneumoconiosis is drawn to the necessity of reporting immediately to their insurers any cases of pneumoconiosis that come to their notice.

MISS JOYCE COLLINS, a time-and-motion-study clerk at the I.C.I. works (Metal Division), Bridge Street, Smethwick, has been appointed a magistrate to the Smethwick Borough Bench. Aged 27, she will be the youngest of the town's 32 magistrates.

SALVAGE began on October 8 to retrieve scrap metal from the wreck of the American Liberty ship, Byron Danton, which ran aground at Mull of Kintyre in March, 1946. The scrap will go to Scottish steel works.

A NEW COMPANY, SHELL-MOULD PATTERN PLATE COMPANY, of Hainge Road, Tividale, Tipton, Staffs, has been established for the complete production of pattern-plates for the shell moulding process, under the direction of Mr. J. G. and Mr. C. T. Thorne.

IN HIS INSTALLATION ADDRESS on October 7 as Master Cutler of Sheffield, Mr. Robert Laurie Walsh, director of the cutlery firm of Champion & Company, suggested that there were indications that the export trade was improving, but, he added, in two years the industry had lost nearly 2,000 good craftsmen.

DURING A SPEECH at the "Ladies' Dinner" of the Worshipful Company of Founders, held in the Vintners' Hall recently, with the Master, Mr. Kenneth H. Adams, presiding, the Rev. R. B. R. Walker, the Upper Warden, stated that this function had been held continuously for more than 300 years.

RESIDENTS living near the Northey Road factory of Sterling Metals, Limited, Coventry, one of the associates of Birmid Industries, Limited, have petitioned the Coventry City Council to take action to stop excessive noise and the offensive smells and pollution of the air, for which they allege the company is responsible.

A WIDE RANGE OF GOODS imported into Ceylon from the sterling area will be freed from all import restrictions soon. The Director of Commerce and Trade, Mr. C. E. P. Jayasuriya, said imports to be decontrolled include iron and steel manufactures, brass, lead and zinc goods and electric cables and wires.

A FIVE-DAY residential study course on industrial relations organized by the Institute of Personnel Management is to be held at the University of Birmingham from November 15 to 20. Detailed information is available from the Study Courses Secretary, Institute for Engineering Production, Southfield, 16, Norfolk Road, Birmingham, 15.

THE CURRENT ISSUE of *Target* (Vol. 6, No. 9), the Government monthly devoted to publishing examples of increased productivity, carries a long article on the developments introduced at the foundry of Rice & Company, Limited, Northampton, following the visit of Mr. H. B. Farmer to the United States as a member of the "Grey Ironfounders'" productivity team.

AT A JOINT MEETING of the Society of Chemical Industry (Corrosion Group) with the London section of the Institute of Metal Finishing to be held on October 19, at 6.30 p.m. in the lecture room of the Chemical Society, Burlington House, Piccadilly, W.1, two papers dealing with the phosphate treatment of iron and steel will be presented and discussed.

BIRMINGHAM'S CIVIC PLATE was added to when a silver coffee service was handed over on October 7. The set was made by Adie Bros., Limited, Snow Hill, Birmingham, and designed by Mr. R. S. Baxendale. Among those present at the ceremony were the Lord Mayor of Birmingham, Mr. F. J. Taylor, joint managing director of Adie Bros. and Mr. Trenchard Cox.

MR. T. C. JAMES, of Tettenhall, one of six brothers, who, in October, 1903, founded the Wolverhampton Metal Company, Wednesfield, presided at a dinner in celebration of the firm's jubilee on October 5. The only surviving member of the family, Mr. James is now chairman and managing director of a firm which began with four employees and now has more than 1,000.

THE STANDARD MOTOR COMPANY, LIMITED, of Coventry, is to have a new factory built at Banner Lane, Coventry, to be used solely for the production of the new "Eight," Sir John Black, the company's deputy chairman and managing director, has announced. It is estimated that the factory will cost £1,000,000, and it is hoped that it will be completed within nine months.

THE RT. HON. VISCOUNT WAVERLEY, P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., will preside at the annual general meeting of the British Standards Institution on October 29, at 3.30 p.m., in the Council Room, British Standards Institution, 2, Park Street, London, W.1. All members of the Institution will be welcomed, but only subscribing members and members of the General Council have power to vote.

AN ORDER has been received by the National Gas & Oil Engine Company, Limited, from the Crown Agents for the Colonies for two 1,250-kw Diesel-engine-driven alternator sets for extensions to the Kumasi electric power station in the Gold Coast. Each will comprise a pressure-charged vertical engine coupled to an 11,000-V alternator manufactured by the Brush Electrical Engineering Company, Limited.

THE DEPARTMENT OF PHYSICS AND MATHEMATICS at the Birmingham College of Technology began on October 14 a course, the first of its kind in the Midlands, to show technical executives the latest developmenst in industrial physical techniques, such as spectroscopy, radiography and electronics. About 30 executives, including the research directors of several large companies, have already enrolled.

TWO DAVID BROWN FACTORIES (at Penistone and Meltham) co-operated in speeding the delivery of 12 sets of ground service equipment which were flown out to various re-fuelling and service points along the 12,000 mile route of the England to New Zealand air race. The components, cast-steel jacking pieces, formed part of an original order for 200 sets placed by the British Electric Company (makers of the Canberra) earlier this year.

MEMBERS OF THE CHESTERFIELD ENGINEERING SOCIETY held a meeting at the premises of Bryan Donkin Com-

(*Continued on page* 492)

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News in Brief

(*Continued from page* 490)

pany, Limited, Chesterfield. About 60 people attended, and the chairman was Mr. E. Cardwell, Principal of the College of Technology, Chesterfield. Mr. R. T. Redfern, managing director of the company, assisted by Mr. G. F. Chambers, technical director, gave an address on Bryan Donkin, and his work. Also many interesting exhibits were shown connected with the history and growth of the firm.

LAST WEEK about 50 London members of the Incorporated Plant Engineers were present at the Royal Society of Arts to hear a lecture by Mr. B. Levy (president of the London branch of the Institute of British Foundrymen) on "Patterns, Castings and Foundrywork." Mr. Levy made a wide survey of foundry practice, and showed slides and photographs. It seemed that his audience had some experience of restrictive practices, for one asked if the bricklaying of a loam mould was done by a bricklayer or a moulder!

A NEW SUBSIDIARY COMPANY of Allis-Chalmers Manufacturing Company, makers of mining and agricultural machinery, of Milwaukee, Wisconsin, U.S.A., is to be formed in Britain. With an initial nominal capital of £100, the company will be known as Allis-Chalmers, Great Britain, Limited, and will handle the parent concern's business in this country, and in export markets served from the U.K.; it will take over the assets and undertaking of the U.K. branch, which includes a factory at Essendine, Stamford (Lincs), on December 1.

REDUCTIONS in the prices of wolfram, copper, and other raw materials which formed a substantial part of the company's operations, resulted in losses of an abnormal character on stocks necessarily carried, said the chairman of Murex, Limited, at the annual general meeting. These losses amounted, before taxation, to about £250,000, compared with fortuitous profits in the previous year of nearly £500,000. The company had added £150,000 to a reserve for the replacement of fixed assets out of the profits of the past year.

SIR ALFRED HERBERT opened on October 7 the new workshop block of Nuneaton's new Technical College. Sir Alfred said that towards the end of the last century, this country was criticized for its lack of technical education in comparison with Continental countries. That reproach no longer remained. Probably the most urgent need to-day was to discover some means of making more economical use of the materials provided by nature—iron and minerals. The world, he said, was never more full of openings in science than it was to-day.

PROPOSALS were approved at an extra-ordinary meeting of Craven Bros. (Manchester), Limited, machine-tool makers, of Stockport (Ches), on October 9 for effecting the two-for-three scrip issue of ordinary shares. Mr. J. R. Greenwood, chairman and managing director, told shareholders that orders had been received this year at an even higher level than the record volume on order at the end of 1952. The company has recently completed a 42-ft. vertical boring and turning mill to the order of the English Electric Company, Limited, for John Inglis & Company, Limited, Toronto.

IN EVERY INDUSTRIAL ORGANIZATION there should be a sound and well-operated production planning and control department. This was emphasized in a report on production control based on the findings of a team of specialists who visited the United States in 1951, which was published last week. There could be no doubt, the report declared, that the high output per man in the U.S. and the apparent smooth flow of work from start to finish were in no small measure due to careful planning and effective control. That, of course, meant having the right material at the right place at the right time.

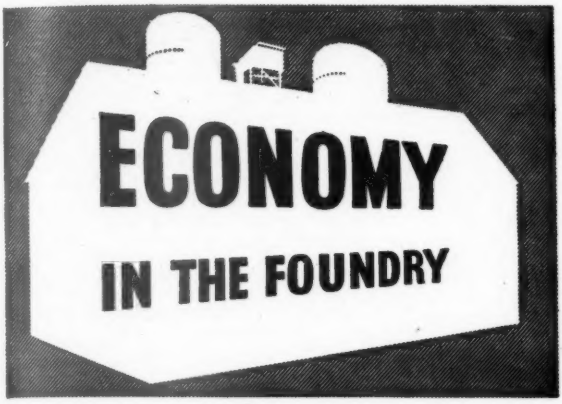
THE NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD have placed an order with Gilbert Gilkes & Gordon Limited, Kendal. One job is for the Kilmelfort Scheme in Argyllshire, covering a 2,870-b.h.p. Francis turbine and a 119 h.p. auxiliary unit operating on 340-ft. head. The other is for a 350 kw. induction generator set to pass the compensation water from Quoich Dam in the Garry Scheme. Overseas orders recently received by the firm include three 173 b.h.p. turbo-impulse wheels for Vancouver Water Works' new dam, and a 230-b.h.p. Francis turbine for the South African municipality of Paulpietersburg.

UNDERWRITING is being arranged by Helbert, Wagg & Company, Limited, for an issue by Babcock & Wilcox, Limited, of £4,000,000 4½ per cent. debenture stock, 1980, at 97½ per cent. The prospectus was published on Monday and the subscription list opened and closed last week. Stockholders and employees of the company will be given preferential treatment on allotment. It is also proposed to issue by way of capitalization of reserves 2,508,133 new ordinary shares of £1 each to ordinary stockholders registered on October 15 in the ratio of one new share for every £2 stock held.

A FINAL DIVIDEND of 12½ per cent. now recommended on the present £400,000 ordinary shares of Stothert & Pitt, Limited, engineers and ironfounders, etc., of Bath, compares with 10 per cent. a year ago, and with the unchanged 5 per cent. interim makes a total of 17½ per cent. for the year to June 30 last, against 15 per cent. for the previous year and 11¼ per cent.—including a 1¼ per cent. bonus—for 1950-51. Permission is being sought to capitalize reserves in order to make a proposed five-for-eight scrip issue of ordinary. £548,152, and the net balance from £230,230 to Untaxed profits have expanded by £110,844 to £296,851.

SINCE ITS EMERGENCE as a public company in 1947, the dividend of H. W. Lindop & Sons, malleable iron founders, of Pleck Road, Walsall, has been maintained at 70 per cent. with the payments covered by average earnings of 185 per cent. The latest results, however, for the year ended June 30 show a sharp drop in earnings, but the directors recommend the payment of a final dividend of 17½ per cent., making 35 per cent. on the capital as increased by one-for-one scrip bonus, which, in effect, represents no change in the distribution. The results recall the warning of the chairman, Colonel C. A. B. Lindop, at the last meeting, when he warned that the position was rapidly changing to a buyers' market, which meant more competition and probably a lighter order-book.

AN EXHIBITION of industrial electronic equipment was opened on October 5 at the North East Birmingham District headquarters in Aston, of the Midlands Electricity Board, and remained open until October 16. The exhibition includes an electron microscope, several types of electronic control equipment and an electronically-controlled flame-cutting machine, in which the tracing head of the machine uses a paper drawing as a template for the automatic guiding of the flame-cutter, instead of relying on hand guidance or a metal template. There is also a photoelectric guard which stops a machine when the operator's hand comes into the danger area. Forthcoming exhibitions include "lighting for increasing efficiency and productivity" (November); "heavy applications of high-frequency and induction heating" (December), and "power factor correction" (January).



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Personal

SKINNINGROVE IRON COMPANY, LIMITED announces the appointment to the Board of Mr. Paul W. Redway, who has been sales manager since 1950.

The secretary of Lithgows, Limited, shipbuilders, Port Glasgow, MR. D. B. CUNNINGHAM, has been appointed a director of the company.

DR. J. W. CUTHBERTSON, assistant director of the Tin Research Institute, was elected president of the Institute of Metal Finishing on October 6.

MR. G. J. SHAW, B.SC., is leaving the Department of Metallurgy, Birmingham University, to join the metallurgical staff of Coneygre Foundry Company, Limited, Tipton.

MR. R. A. BALFOUR has joined the Board of High Speed Steel Alloys, Limited. He is chairman of Tinsley Rolling Mills Company, Limited, and managing director of Arthur Balfour & Company, Limited, and is on the local Board of National Provincial Bank.

MR. KENNETH ASPLAND, secretary of the Standard Motor Company, Limited, Coventry, for the past ten years, has been appointed to the Board of directors. Mr. Aspland is a Manchester man by birth, and is 41. After qualifying as a chartered accountant, he spent several years with Cadbury Bros. before joining Standard Motors in 1940.

INVITATIONS to become directors of Newton Chambers & Company, Limited, of Thorncliffe, near Sheffield, have been accepted by MR. A. W. GROGAN and COL. D.S. BRANSON. Mr. Grogan was the company's secretary from 1931 until his retirement last March. Col. D. S. Branson is head of the Sheffield legal firm of Branson & Son, and who retired from his directorship of the Park Gate Iron & Steel Company, Limited, in 1951.

DR. JOHN DICK, B.SC., PH.D., M.A., M.I.MECH.E., Reader in Engineering Science in the University of Oxford, has been appointed to the Chair of Engineering & Drawing in University College, Dundee, as from April 1, 1954. Dr. Dick graduated at Glasgow University with first-class honours in electrical engineering and first-class honours in mechanical engineering. He was lecturer in mechanical engineering at Sheffield University, where he received the degree of Ph.D.

MR. RICHARD SHARP retired from the position of furnaces' general manager with the Stanton Ironworks Company, Limited on September 30. He came to Stanton in 1926, after having been, successively, blast-furnace manager at the Lackenby Iron Works, Middlesbrough, and at the Clarence Iron Works of Bell Bros., Middlesbrough. Whilst at Stanton, Mr. Sharp was responsible for the building of the present furnaces, and also for the building of the blast furnaces at Wellingborough. A presentation was made to Mr. Sharp by Mr. P. H. Wilson, deputy managing director.

MR. H. J. GIBSON was, on October 5, elected chairman of the South Midland Centre of the Institution of Electrical Engineers. He has been associated with the electrical industry for 41 years, 23 of them in the Midlands. He joined the Shropshire, Worcestershire and Staffordshire Electric Power Company in 1930 and, when the industry was nationalized, he was appointed chief commercial officer of the Midlands Electricity Board. His connection with the Institution of Electrical Engineers dates from 1918.

Mr. W. M. B. FURNISS, assistant managing director of the Electric Construction Company, Limited, Wolverhampton, formally handed over to Mr. Walter Tonkinson on October 6, a technical reference library, for which employees subscribed, as a gift on his retirement. Mr. Tonkinson, who had been with the company since 1898, becoming a director in 1942, asked that the gift should take the form of a library which would be available to all personnel at the Bushbury works of the company.

MR. DENNIS POLLOCK, who has been appointed general manipulation production officer to the firm of Accles and Pollocks Limited, Oldbury, is carrying on a family tradition. He is a grandson of Mr. Tom Pollock, the chairman of the company. He has been associated with the works since 1939, but served in the Army from 1940-46. On demobilization he became mill manager at the Oldbury factory and now succeeds Mr. H. Unsworth, who is leaving to take up a post with the Lockheed Brake Company, Limited.

MR. J. W. ELLIOTT, chairman of Swan, Hunter & Wigham Richardson, Limited, Wallsend-on-Tyne, and a director of Barclay, Curle & Company, Limited, Glasgow, has been elected president of the Shipbuilding Conference. He succeeds Mr. Charles Connell, chairman of Chas. Connell & Company, Limited, Glasgow, who has completed his term of office. Dr. J. M. McNeill, deputy-chairman and joint managing director of John Brown & Company (Clydebank), Limited, has been elected vice-president of the conference.

DR. A. C. WALSHAW, assistant professor in the engineering department of the Royal Naval College, Greenwich, since September, 1949, has been appointed head of the Department of Mechanical Engineering at the Birmingham College of Technology. Before going to Greenwich, he was for three years one of H.M. Inspectors in the technical branch of the Ministry of Education. Dr. Walshaw graduated with first-class honours at the Imperial College of Science and Technology and subsequently obtained the degrees of M.SC. and PH.D. there. He has done a considerable amount of research on the elastic and plastic properties of steel in torsion and trials of heat-engine plant.

MR. ERNEST N. WRIGHT, managing director of E. N. Wright, Limited, Millfields Foundry, Bilston, was presented on October 2 with a set of golf clubs, bag and trolley by workpeople, to mark his retirement after a life-long association with the firm. The presentation was made by Mr. Arthur Stanley, foundry foreman, at the social centre of Stewarts and Lloyds, Limited, with which group the firm is associated. Mr. Wright has been managing director since the business was formed into a company in 1919. The business was founded by his grandfather over a century ago in Swan Gardens, Wolverhampton, and was transferred to Bilston towards the end of last century. Mr. Wright's only son, Mr. Reginald Wright, is a director of the firm.

Obituary

GEORGE KENT, LIMITED, announce the death on October 3 of MR. RICHARD W. BEDFORD, M.B.E., for many years works manager of their main factory in Luton. A production engineer of the first order, Mr. Bedford joined Kent's in June, 1904, and moved to Luton from London when their new works were opened in 1908. By shortly after the end of the 1914-18 war he had been appointed to works managership. Of a most cheerful and kindly disposition, Mr. Bedford was always acces sible to the younger engineers; and his great experience was of benefit whenever decisions had to be made.